Electrical Review

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Electrical Review

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It is impossible for one looking over the newspapers and other sources of information which come to the office of a technical journal of this character, to avoid being forcibly struck with the enormous extension of the electric railway in the United States. There must be at this minute several thousand miles of new construction under way. Nearly every important trolley system in the United States is extending its lines and new ones are constantly cropping up; combinations are being formed everywhere between existing lines, missing links are being built, and already trolley systems have extended themselves so as to reach over distances of more than two hundred miles. Another Summer of such extraordinary activity will fairly gridiron the eastern and middle Western States with a continuous net-work of trolley roads, rivalling that of the steam railways now in existence. It is hard to predict the future of a movement so vast and so natural. There has been nothing like it in history, perhaps, unless one looks back to the early days of railroad building in England. What its effect will be upon the steam railroads it is very difficult now to say, except that it furnishes them with a continual (and often exceedingly expensive) object lesson of the superiority of the electric motor and of the popularity and convenience of the single car train traveling along the highway and stopping wherever a passenger wants to get off or on. The subject is too large to discuss in the space at command, but for the thinking railway manager it must be to-day the most important subject for consideration.

The thermo-electric motor illustrated and described on another page is a very interesting machine, considered from the point of view of the physicist, as it works through two transformations of energy, heat being turned into electricity through the action of thermo-electric couples, and the electrical energy thus produced manifested as motion. It is curious to speculate how the machine would work if reversed, or if driven by power applied to it. The least residual magnetism in it would cause currents in the short-circuited thermo-elements, and thus produce a separation of temperatures at the junctions of the thermo-electric couples, but there would be no tendency for the fields to build up their magnetism. If the fields were permanent magnets the machine would be perfectly reversible, generating heat from motion or motion from heat, as desired.

A newspaper correspondent at Tien-Tsin, China, says that almost the first building destroyed by the onslaught of the Chinese troops on that city was the large new woolen mill, the first of its kind to be built in China, which was operated throughout by electric power. This is a strange coincidence, that the highest development of Western civilization in that moribund country was the first victim of its reactionary madness. Still, the woolen mill will be rebuilt sooner or later, and its motors will turn under a new régime that will assure them a chance to wear out peacefully in useful work, rather than perish from cannon shot and fire. And there will be other mills and other motors needed. Think of the street railway business waiting to be done in a dozen cities of enormous population and no transit facilities!

Work on the subway, in New York city, is progressing steadily at half-a-dozen points, but very slowly on account of the slow delivery of iron and steel which will enter to a large extent in the work. It is expected that the first lot of structural metal will be delivered about September 1, when work will be undertaken with greater activity. It will be several years before the subway will be ready for its electrical equipment.

ELECTRICITY AND CIVILIZATION.

As one looks back over the recent history of civilization he finds that certain salient features of the advance made by the race in historical times have been connected with inventions and discoveries. The nineteenth century, which is just closing, has been especially marked by the development of knowledge and application of electricity to the service of man, and doubtless in the future will be looked upon as the electrical period when this new agent first profoundly influenced and modified the course of human history.

In all of the modern progress of discovery probably nothing has so deeply affected the course of politics and had so great influence on society as the two inventions which marked the close of the eighteenth century—the steam engine and the electric battery. Just a hundred years ago Volta, by a process of brilliant experiment, discovered the electric current and put into the hands of the race an instrument whose power has only just begun to be appreciated. Thirty years passed before the first practical application of electricity was made in the telegraph, and this continued for nearly forty years longer to be the only application that was of any particular commercial importance, there being, in fact, but one other, electro-plating. The influence of the telegraph upon civilization is yet too recent to be fully appreciated, but its immediate effect has been to make the world smaller, to disperse over it news and to assist in that interchange of ideas which works for the solidarity of the race and against war and misunderstanding. Simultaneously with the development of the telegraph has come high-speed transportation by railways, and this is so dependent upon electrical means of signaling and communication that without the instantaneous telegraph it is certain that railroads could not be operated as they are to-day. In this way one may say that, to a degree, transportation is a corollary of electrical advance.

The effect of the telephone has been to change the nature of commerce in cities and to bring about new ways of doing business, impossible before its appearance. It has freed an army of messenger boys and permitted them to do better things. It has enabled already the conduct of extensive business affairs to be managed with the utmost facility from a central point which may be remote from the direct operations and thus, in making more easy methods of manufacture and construction, has assisted and accelerated the course of evolution. The electric light has done more to dissipate moral darkness than most people realize—the proverb that one electric light is as good as one policeman being by no means a vain statement; but perhaps no agency has had in so short a time so great an effect as has the electric railroad, now in the thirteenth year of its flourishing age. It is confidently expected that the figures of the census of 1900 now being tabulated will show that the maximum period of growth of cities in the United States has passed and that a reaction has set in, expanding the suburbs and decreasing the density of population in crowded centres. There is no work conceivable by the most enlightened philanthropy that is of more importance, both to the future and the present of civilized countries, than the proper housing of urban populations. To spread the city into the country and to give every family a chance at the fresh air and daylight is something that the ubiquitous trolley car has already accomplished in many places, and is steadily doing wherever it has been introduced in the greater cities. In certain smaller ways electricity has also had a direct influence upon the method and the conditions of living of the population. In all ways it has been one of the most potent instruments of civilization in this century and, as the century ends and we look forward, every appearance indicates that in the future it is destined to be even a greater force than it has been in the past.

In another column of this issue is a description of the new American-made cable about to be laid between Unalaklik, St. Michael, and Cape Nome, in Alaska. It is to be hoped that this enterprise will be the first of many long, deep-sea cables constructed by American makers, for it is only in this one department of electrical engineering that the United States has been behind its neighbors. The new cable may, before long, be a link in the trans-Pacific cable, on the northern route.

CHINESE.

The esteemed New York *Times* has this to say about a paragraph in these columns last week:

> No less harsh epithet than "Chinese" is applied by the ELECTRICAL REVIEW to the manufacturers of automobiles, all because they continue to give their machines a form that makes them look like "a horse vehicle without a horse." "In other branches of design," declares the indignant critic, "the best taste has unanimously decreed that the function of the structure should be expressed in its external appearance; there should be no concealment of the mechanism of structure, because the highest canons of æsthetics demand that for beauty a structure should be not only symmetrical but truthful. It is just this that the ordinary automobile is not. It does not look like a self-propelling vehicle, and it does not even suggest that it contains the machinery for its own propulsion. It is thoroughly Chinese in its adherence to the good old things that were." That, undoubtedly, is orthodox criticism, but why didn't this well-instructed writer go ahead and tell the automobile manufacturers just what to do in order to make a four-wheeled vehicle carrying human passengers look materially different from other four-wheeled vehicles designed for the same purpose? The task is by no means an easy one—by no means as easy as that of denouncing failure to accomplish it off-hand and in a hurry.

There are several reasons why we have not made an attempt to design a proper automobile. One of them is that we are kept busy by the ELECTRICAL REVIEW to the exclusion of other things. But our columns are open to anybody with a design that, in our judgment, meets the difficult conditions of the case. It is no easy matter to design a type of vehicle that shall be at once convenient, beautiful, and free from the fault of mimicry. It took a long time to get the traces of the stage-coach out of the railway passenger car, and the trolley car is still a magnified and glorified horse car. Some day, though, either through a stroke of genius or by the slower method of evolution, we will have the kind of automobile that is wanted—one that does not seem to need a horse in front of it. The man who undertakes to make the design must absolutely lay aside preconceived ideas and prejudices. He must forget carriages and vehicles of all sorts, and starting from the few simple data necessary must devise a structure fitted to its purpose and beautiful to the eye. For this man there is much chance of reward. Meanwhile, manufacturers of automobiles, who are most interested in this subject, are too busy filling orders for the old types to bother themselves with a new one.

The Electric Lighting and Tramways of Buenos Ayres.*

The public supply of electricity in Buenos Ayres dates from about 1888. From that year until 1898, it was in the hands of two companies, one of the strongest gas companies being one, and the other a private firm; both seemed to suffer from a lack of enterprise, probably for want of capital. The private firm of Sr. Rufino Varela is the one which formed the nucleus of the system about to be described. It owned two small stations, one a direct-current system of 250 kilowatts capacity, in the basement of the Opera House, and the other a mixed alternating and direct current at the rear of the Politeama Theatre. Almost all the theatres were supplied with electricity from one of these two stations. In 1897, the Cia. General de Electricidad was formed in Paris to acquire and develop the concessions and systems owned by Sr. Rufino Varela, Jr.

The capital of 6,000,000 francs was raised in Buenos Ayres, Paris and Berlin, the headquarters being in Paris; in fact, in Buenos Ayres it is known as a French company. A contract was at once drawn up and signed with the Union Electricitäts Gesellschaft, Berlin, for the complete equipment of the new system, from the coal pile to the consumers' meters, and Count Charles Cicogna was appointed engineer and manager in Buenos Ayres. The contractors immediately sent one of their engineers, Mr. W. S. Hulse, to Buenos Ayres to get the data necessary for the drawing up of the plans in Berlin; after having arranged the necessary details he again returned to Buenos Ayres to take charge of all the construction, with Mr. J. T. Cornish as chief assistant.

The system finally adopted was the monocyclic alternating current, generated at 3,400 volts, and distributed from transformer sub-stations on a three-wire network, having 230 voltes between the outers, and 115 at the lamps.

A suitable piece of land was bought in the Paseo de Julio, about half-way between the Retiro Railway Station and the waterworks; its position, about 250 metres from the river bank, made it convenient for obtaining water for condensing, and the facilities for discharging coal were also good.

FIG. 2.—SYNCHRONOUS MOTOR-DRIVEN EXCITER, BUENOS AYRES.

On this ground a temporary station was at once erected, to help out the overloads of the other stations, and also to carry out a contract to supply the Buenos Ayres & Belgrano Tramway Company with power to run their system. The buildings for the new station were commenced immediately, and before the roof was on the engine room, one of the 500-kilowatt sets was running under a temporary wooden shed; it continued to run thus for more than three months, taking steam from the boilers in the temporary station.

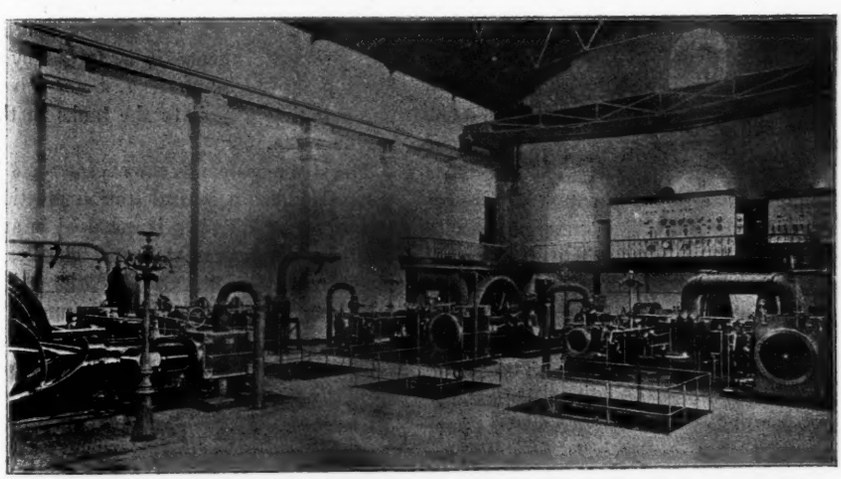


FIG. 1.—GENERAL VIEW IN THE ENGINE ROOM OF THE BUENOS AYRES COMPAÑIA GENERAL DE ELECTRICIDAD.

The site of the generating station is at the northern side of the city, and at the periphery of the distributing area; it is within 100 yards of the most fashionable residential district, Avenida Alvear, and it speaks well for the construction and management that no complaints have ever been made as to smoke, exhaust steam, or vibration, notwithstanding the large size of the station.

The new buildings, which cover an area of 2,730 square metres, are of red brick, and comprise engine room and basement, boiler room, pump room, offices, stores, repair shops, lavatories and wardrobes for the men, and a suite of dwelling rooms for the engineer-in-charge.

The boiler room is parallel to the engine room, and now contains eight Belleville water-tube boilers, built by the firm of Delaunay, Belleville & Company, of St. Denis, and arranged in four batteries of two each, four boilers on each side of the room. The chimney is 60 metres high and 2.40 metres diameter at the top. It is lined with fire brick to a height of 45 metres, an air space of six centimetres being allowed between the lining and the wall of the chimney. The Belleville type of water-tube boiler consists essentially of an upper steam cylinder and a lower water chamber, with a series of straight tubes, arranged in zig-zag, connecting them. The generating tubes are in vertical groups, technically termed elements and are placed in such a manner as to form a kind of flattened spiral of 12 straight tubes; detail views of one of these elements appear on a later page. The ends of the tubes are connected together by being screwed into cast steel boxes, which form the turns of the spiral.

The connections are made so that the whole 12 tubes form one continuous passage for steam and water from the bottom to the top. The water, after having passed through any tube, has to traverse a short distance horizontally through the end boxes to obtain access to the next tube in its ascent. The front of the lowest part of each element is connected to the steam collector. There are 10 of these elements in each boiler. The inclination of the tubes is very small, being only two and one-half degrees to the horizontal.

The series of 10 elements are placed side by side. The mixture of steam and water generated in the tubes is discharged into the top steam collector from the tops of the elements. In this collector the steam is separated from the water by means of a series of baffle plates, the steam being drawn off by means of the stop valve, and the water flowing back along the bottom of the collector to the return water pipes on each side, and thence again to the elements.

The feed is admitted through a small non-return valve at the middle of the top collector through a small orifice at a pressure of 450 pounds, which is considerably

*From the London *Electrical Review*.

higher than the actual working pressure of 225 pounds.

The automatic feed apparatus consists essentially of a chamber connected at top and bottom with the elements of the boiler, and to which the gauge glass is attached. This chamber contains a hollow float which is connected by a system of levers with a valve on the feed pipe.

The space between the fire and the lowest tube is not large, so that unless complete combustion of the gases takes place within a short distance of the fire, it will take place above the lowest tubes and much heat will pass off to the chimney, which, had the combustion taken place lower down, would have been abstracted by the water in the tubes. With a properly regulated and thin fire which passes the proper amount of air, there is less likelihood of this, but it has been found that the forcing of steam in small jets above the fire has a beneficial effect in thoroughly mixing the gases and also in accelerating the rate of combustion. It should be observed that the apparatus is purely for mixing the gases, and not for forcing the rate of combustion of the coal. The arrangement consists of a square pipe about 12 inches above the fire bars, with a series of nozzles slightly inclined downwards and discharging steam among the gases above the fire with sufficient force to reach all parts of the furnace and thoroughly mix the combustible gases with the oxygen.

The heating surface of each boiler is 106 square metres, and the output 3,750 kilogrammes of steam per hour.

A safety device is fitted to each element in the shape of two fusible lead plugs, which are driven into small holes bored into the front of the tube boxes, one near the upper part and one near the lower part of each element. By means of a special plug-driving tool, these can be replaced while the boiler is under pressure.

Every boiler is fitted with a special economizer, which in form and general arrangement is exactly similar to the boiler elements; the tubes, however, are shorter and of smaller diameter. The economizer is placed about four feet above the top of the generator, and the hot gases pass through it on the way to the chimney. The boilers are hand-fired, and coal is brought into the room on a small Koppel railway, there being a track on each side of the room, equipped with three turn tables.

In the pump room are three Belleville pumps, two of which are capable of feeding all the boilers. These take their water from two small tanks of a combined capacity of 35 tons. There is no lack of feed water supply, which can be taken from either of the following sources: (1) Hot well; (2) river water, before or after circulating through condensers; (3) artesian well No. 1; (4) artesian well No. 2; (5) city water supply.

The boilers feed into a main steam ring of mild steel pipes, with steel flanges and copper bends; to allow for expansion there are two double S copper expansion bends. The smaller steam pipes are of the Mannesmann patent weldless steel. The feed pumps have an independent steam ring, and the feed is also arranged on the ring system. From the main steam ring two separate pipes lead into the engine room.

The engine room is of generous proportions, being 36 metres long by 22 metres wide, and 13 metres to the top of the electric overhead traveler. The total height of the steel trussed roof at the apex is 18½ metres. The walls are glazed to a height of two and one-half metres, with white tiles, and the floor is covered with mosaic tiles. Here there are four 500-kilowatt, 3,400-volt monocyclic alternators, each mounted on the shaft between the crank disks of a horizontal compound engine, two 30-kilowatt steam exciters, and a 30-kilowatt motor-driven exciter.

The main engines are by the Edward P. Allis Company, of Milwaukee, with cylinders 20 inches by 40 inches by 36 inches stroke, and run at a speed of 125 revolutions per minute. They are fitted with the usual Allis-Corliss valve gear, driven by double wrist plates on each cylinder, which are actuated by two eccentrics, one steam and one exhaust. The cut-off is regulated by a Reynolds automatic governor, controlling the high-pressure cylinder only when running on a lighting load, but when the alternators are used to drive the new motor-generator set for the tramway, the governor can be arranged to control the low-pressure side also. The piston speed is 750 feet per minute. The flywheel, which is very massive for its diameter of 12 feet, weighs 17½ tons, and the whole crank shaft, with flywheel, field magnets, and crank disk, weighs 35½ tons. The governor is provided with a knocking-off gear, so that in case the belt should break, the steam is immediately shut off, thus preventing the running away of the engine.

Each engine is provided with an independent Wheeler surface condenser of the Admiralty type, of 1,000 horse-power capacity, so as to be able to cope with an overload. These condensers are placed in the basement of the engine room, where they are easily overlooked by the driver without leaving his engine, as there is an open hatchway in the floor which gives a full view of them.

Between the low pressure cylinder and the condenser there is an automatic exhaust valve which allows the engine to exhaust to the atmosphere in case the vacuum fails. The air pump sends the condensed water to the hot well, which also receives the condensed steam from the traps; the hot well pump forces the water into the feed tanks, passing on its way through two Germania oil filters. These separate from it the large quantity of oil which is used in the cylinders of the engines.

The exciter engines are made by Gritzner, of Durlach; they are of the vertical compound type, with piston valves to both cylinders, the cut-off being controlled by a shaft governor, which varies the travel of the high-pressure valve. The cylinders are lubricated by a small force pump driven by the shaft; the main bearings of the crankshaft are lubricated by oil rings, all other wearing surfaces being fed from two small tanks. The cylinders are 225 and 340 millimetres diameter by 240 millimetres stroke the speed being 325 revolutions per minute. These engines take their steam from any of the engine reducing valves, and can exhaust to any of the condensers or to the atmosphere.

The dirty oil is drained through piping from all parts of the engines to a tank in the basement, whence it is forced by a hand pump to a filter, a motor-driven pump lifting the oil to the tanks in the engine room.

The steam system in the engine room is somewhat new in central station practice, and as far as is known is not used in any English or American station. The steam pipes leave opposite ends of the boiler room, taking steam at 210-225 pounds into the engine room, where they are interconnected; from this point branch off four regulating reducing valves *(regulateur-détendeur)*. At each end of the group of reducing valves there is a very large separator with baffle plates, through which passes all steam entering the engine room. Each of these reducing valves is connected to one engine; the steam passes through two other separators before entering the high-pressure cylinder, a branch being taken off to the auxiliary starting valve of the low-pressure cylinder and one to the condenser steam pump.

Each engine is dependent on a low-pressure system of its own which is controlled by the reducing valve; this has a range of from 40 to 130 pounds, and this pressure is adjusted by hand according to the load on each engine. For a traction

load the steam pressure can not be adjusted so closely as for a lighting load, otherwise the engine would not be able to respond quickly enough to the sudden variations which are incident to the service. The reducing valves were furnished by the Belleville Company. With the exception of these valves and the main steam pipe entering from the boiler house, all piping is carried in the basement, which is about nine feet high; this allows an unobstructed view of the engine room, and gives easy access to all parts. The main piping is carried on rollers, so that it can move freely under expansion. The whole of the piping in the station is covered with magnesia, and was furnished by Seiffert, of Berlin.

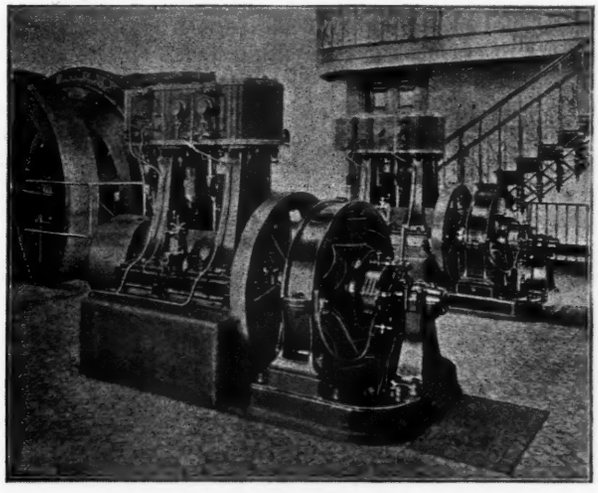


FIG. 3.—STEAM DRIVEN EXCITERS, BUENOS AYRES.

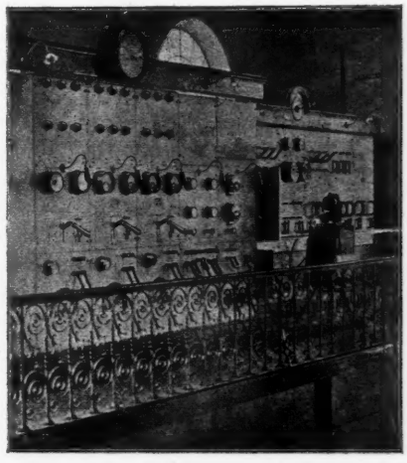


FIG. 4.—MAIN SWITCHBOARD, BUENOS AYRES.

The separators are all drained to the hot well by Kuntz patent expansion traps.

A large tunnel was driven from the station to the river, 250 metres distant, in order to bring in the circulating water for the condensers. The receiving chamber is two metres below the lowest water level in the river, so that an ample supply of water is always obtainable. Large pipes are also carried out a considerable distance into the river from the mouth of the tunnel, so as to obtain as clean water as possible. From the receiving chamber the water passes through strainers into another and larger chamber, whence the condenser pumps draw their supply. The discharged circulating water is conducted through an outlet tunnel back to the river.

The electrical generating system is a polyphase alternating current, generated at high tension and transmitted to 50 substations scattered all over the city; in these are placed stationary transformers for distribution to the consumers on a three-wire system, with 230 volts between the outers.

The monocyclic system was adopted owing to its advantages where the distribution of energy for lighting is the principal consideration, and where the demand for motive power is small or remains to be developed.

SCIENCE BREVITIES

Time Limit Incandescent Lamps—A German firm has recently brought out a type of incandescent lamp which can be set in advance to burn a given number of hours and then automatically extinguish itself. In the base of the lamp is fixed a copper tube containing a central part of copper wire and filled with a solution of sulphate of copper. A current is arranged to pass through this solution from the wire to the tube, so that a continual electrolytic solution of the wire takes place. As soon as the wire is all dissolved, the current is broken and the lamp goes out. The size and length of the wire may be set for any given number of hours and the lamp thus becomes automatic in its action.

Anomalous Electromagnetic Dispersion—As in optics, so in the domain of electromagnetic radiation, the angle of refraction varies with the incident wave-length. In some chemical substances the dispersion does not vary continuously with the wave-length, but changes abruptly at certain points, and then we have anomalous dispersion, as in the solutions of certain copper and chromium salts, and, according to Kundt, in iron, nickel and cobalt. Recent researches have shown that these anomalies are invariably found in the neighborhood of absorption bands, and the experiment of Macaluso and Corbino, first supposed to indicate an inverse Zeeman effect, has since been connected with the anomalous dispersion of sodium vapor in the neighborhood of the D lines, says the *Electrician*. Herr A. Schmauss has made some measurements of the electromagnetic rotatory dispersion in the fuschine solutions and in didymium glass which justify the general conclusion that optical anomaly in dispersion is invariably associated with electromagnetic anomaly. In strongly absorbing media, the anomaly extends for a considerable distance on both sides of the absorption band, and it increases with the concentration and with the narrowness and sharpness of the absorption band.

Spark Length of an Induction Coil—Mr. R. Beattie has studied the effect on the secondary spark length of using different materials for the primary poles, and of varying the rate of break and the electro-motive force in the primary circuit, his results being abstracted by Mr. Fournier d'Albe. In place of the usual vibrating interrupter a special contact-breaker was employed, by means of which the primary poles could be separated either slowly or quickly, as desired. As regards the material of the poles, platinum gives a much longer spark than either lead or carbon. This is no doubt due to the fact that carbon is more easily disintegrated, and sets up an arc which bridges the gap. A quick break gives a long spark, and a slow break a short spark. As a rule, a high electro-motive force, by prolonging the arc, gives a shorter spark in the secondary. But this is not the case with carbon, zinc and lead poles and a slow break. The "best capacity" for increasing the length of spark also depends upon the rate of break, decreasing as the break is quickened. In the case of zinc, however, it increases, and for certain capacities a quick break may actually give a shorter spark than a slow break. This peculiar behavior of zinc when used as a break pole is probably connected in some way with its non-arcing properties.

NOTES ON LIGHT.

BY WILLIAM ROLLINS.

NOTE CV—WHICH WAY DOES THE "CURRENT" FLOW?

Current is used here under protest and only to avoid making a new word. I have asked several authorities which way the current flowed, and always the answer was given in a tone that showed the question was considered a foolish one. Yet when the second Maxwell question was asked: "But what's the particular go of it?" the answer was always unsatisfactory.

Maxwell, with his acute mind, realized he did not know, as the following quotation from paragraph 568 shows: "So far are we from knowing its absolute value in any case that we do not even know whether what we call the positive direction is the actual direction of motion or the reverse." Therefore, this seems a suitable question to put to an X-light tube. In earlier notes the result was incidentally mentioned, but here, in its proper place, it may be dwelt upon.

Make a tube like the one shown in Fig. 76, with two concave aluminum terminals exactly alike. Exhaust, while hot, to a high vacuum without sending any "current" through it. Make the right-hand terminal positive, the left-hand negative, not using the central target as part of the circuit. Send a "unidirectional" current through the tube and continue pumping. When the resistance of the tube is equal to 10 centimetres of dry air, reverse the current, making the left-hand terminal positive and the right-hand negative. It will be found that the resistance to the development of the Varley stream is greater than in the first position.

This is the same old phenomenon mentioned in former notes, but let us look at its bearing on the direction of the "current."

By the preliminary pumping without "current" we pretty well cleaned out the gas from the space enclosed by the walls of the tube, what was left being mostly amalgamated with the terminals. Already it has been shown that under these circumstances it is the gas amalgamated with the terminals that we depend on to carry the charges through the ether between the terminals. Now, the more the gas is driven out of the terminals, the higher becomes the resistance of the tube, therefore, when one terminal is more quickly exhausted than the other, we may consider that this was the direction by which it was easiest for the strained ether to relieve itself. But gas came out of both terminals, therefore, if we wish to retain the word current, we must make it plural and those who love the book of Faraday will be glad of it.

With a current alternating so rapidly that it approaches the electromagnetic phenomenon of light, charges would not be carried by matter acting like projectiles, for the particles, owing to their inertia, would not have time to move across an appreciable space in the ether. All they could do would be to tremble, the energy spreading as ether vibrations and there would be no "current," the strain being relieved by the ether vibrations.

NOTE CVI—RELATION BETWEEN GAS AMALGAMATION AND TESLA LIGHT.

To-day I have been reading Tesla's striking lecture before the Institution of Electrical Engineers, in London, in 1892, and have been struck with one passage on which the phenomenon of gas amalgamation appears to bear. He held one of his vacuum tubes in his hand while standing in the static field, or, as it should be called, the space of ether strain, for a field is a flat, while this is a three-dimension thing. The tube glowed with a brilliant light. Taking another with a higher vacuum, he showed that under the same conditions it was dark.

A discharge from a Tesla coil was then sent through it, when it became luminous, like the first, after being separated from the coil. He then went on to say: "I may put it away for a few weeks or months, still it retains the faculty of being excited. What change have I produced in the tube in the act of exciting it? If a motion imparted to the atoms, it is difficult to perceive how it can persist so long without being attended by frictional losses, and if a strain in the dielectric, such as a simple electrification would produce, it is easy to see how it may persist indefinitely, but very difficult to understand why such a condition should aid excitation when we have to deal with potentials which are rapidly alternating." It appears that the explanation of the problem is this: The particles of gas which, in previous notes, have been shown to be amalgamated with the glass and terminals, were some of them sent into the free space in the tube by the stress of the coil, and, therefore, the usual bombardment by these particles could go on just as in the tube which had a lower vacuum, for in this second tube the vacuum was now lowered.

NOTE CVII — A LIGHTNING STORM MAY BEGIN QUIETLY.

In Note civ was shown a lightning flash of striking character. Here is described another type. We usually think of lightning storms as coming from somewhere; in this part of the country generally from the southwest, and as passing over; but such a course is not necessary, for I have been present at the birth of several.

My camp is about 1,100 feet above the sea, on an elevation overlooking the immediate country, and guarded by a mountain wall from 5 to 10 miles distant, extending from north to southwest. On this wall, or within it, lightning storms frequently arise. The night of July 17 was clear star light, without one cloud. Slowly a little one arose, forming out of the pure sky, and began to grow, glowing with a rose-pink light, beautiful in the darkness. No noise could be heard. The cloud increased in size, and became, at intervals, more brilliant. Occasionally could be seen the irregular bright lines which Faraday claimed were simply the illuminated edges of a dark cloud behind which the lightning was playing. Such could not have been the case here, for when another suffused glow came it could be seen that there was no cloud outline to correspond with the shape of the bright band.

For an hour photographs were taken at intervals, before the glow discharge rose sufficiently in potential to cause a flash strong enough to be heard at my distance from the cloud, about five miles. Then the atmospheric disturbance rapidly increased, the outrushing under wind arose and a powerful storm was soon above us. Here was the phenomenon that Tesla, in his lecture already referred to, spoke of: "Such discharges of very high frequency, which render luminous the air at ordinary pressures, we probably often witness in Nature" . . . . "In trials of this kind the experimenter arrives at the startling conclusion that, to pass ordinary luminous discharges through gases, no particular degree of exhaustion is needed, but that the gas may be at ordinary or even greater pressure."

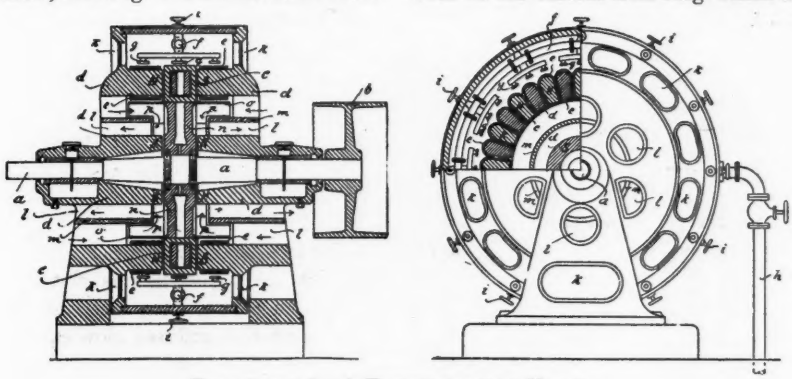
Association of Edison Illuminating Companies.

The Association of Edison Illuminating Companies will hold its annual meeting at the Grand Union Hotel, Saratoga, N. Y., on Tuesday, Wednesday and Thursday, September 4, 5 and 6. An interesting programme has been prepared and a large attendance is expected. Mr. John W. Lieb, Jr., is president and Mr. John W. Howell, secretary, of the association. Its membership is composed of the various Edison electric illuminating companies throughout the United States.

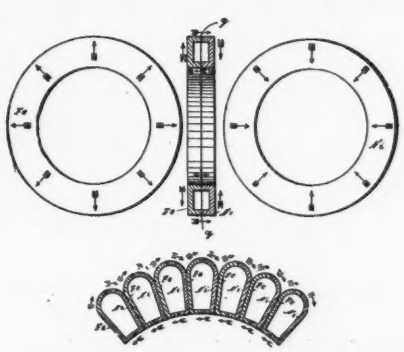
A Thermoelectric Motor.

The exceedingly ingenious thermoelectric motor here illustrated has just been devised by Herr Carl Mayer and is described in a German contemporary. In it both the current necessary for the excitation of the field magnets and that for rotating the armature is generated by thermoelectric elements in the machine itself.

Referring to the illustrations, Fig. 1 is a vertical section of the machine through the shaft, and Fig. 2 is an elevation from one end, part of the casing being cut away to show the interior arrangements of the machine. On the shaft *a*, which carries the pulley *b*, a ring-shaped thermoelectric element *c*, closed upon itself, is built up. On each side of this are the field magnets *dd*. For the excitation of the field magnets thermoelectric elements are also used, each of the poles being encircled by a short-circuited element *e* for the purpose, the current having the same direction in each of them. For the heating of the junctions of the thermoelements, both on the rotating armature and on the fields, an encircling gas-pipe *f* is used, numerous burners *g* being tapped off at appropriate places, and so arranged as to heat the junctures of both sets of elements. The gas is supplied through the pipe *h* (Fig. 2) and the size and number of the flames can be regulated by the cocks *ii*, each controlling a group of burners. In the casing of the motor are windows *KK*, which allow the flames to be observed. The opposite junctions of each couple of the thermoelectric elements are kept cool by means of ventilating passages and apertures arranged to permit of free circulation of the air. In the field magnets a series of holes *l* are provided for air circulation. These are divided by the ventilating ring *m* into two parts. On the spider of the armature *n* are mounted the ring *o* and vanes *p*, which cause a rapid circulation of air in the direction shown in Fig. 1 when the armature revolves, thus cooling the inner junctions of the couples. Figs. 3, 4 and 5 show, respectively, an axial section, and left and right-hand elevations of the rotating part—composed, as described above, of thermoelectric elements short circuited upon themselves. Along the central line *q* of the inner and outer faces of the ring armature, or revolving part, are the junctions, the component parts of the couples being, for example, of nickel and iron. In this way all the nickel parts are on one side and all the iron parts on the other of the central iron ring which fulfills the function of the core in the ordinary Gramme armature. The elements are not connected in series, but are short circuited upon themselves. The construction of the field magnet is clearly shown in Fig. 6. The pole faces are divided into numerous tunnel-shaped sectors, as shown, each of which is surmounted by a short circuited element, these, as in the armature, not being connected together, but acting independently to magnetize the various sectors in the same sense, presenting similar poles on each side to the armature.



FIGS. 1 AND 2.—A THERMOELECTRIC MOTOR.



FIGS. 3, 4, 5 AND 6.—A THERMOELECTRIC MOTOR.

The operation of the motor follows the well-known principle of Faraday's disk, wherein axial currents in a disk placed between the poles of a magnet cause the former to rotate. In the working form of the thermoelectric motor here illustrated it is evident that the effectiveness of the arrangement is increased by the doubling of the current elements on the two sides of the rotating ring in a strong magnetic field. In effect the machine is a double unipolar machine, as the section of its magnetic current in Fig. 7 will show.

The operation of the machine is as follows: When the joints of the thermoelectric couples on the armature and fields, next the gas jets, are heated, an electric current is produced in both, the inner junctures of the various couples being cool. The armature at once begins to turn. The turning of the armature moves the wind-vanes attached to its spider, so that the faster it goes the more air is blown through upon the inner junctions. By regulating the gas-cocks the heating of the outer junctions is determined, so that the power exerted by the motor may in this way be regulated. Another method of regulation is by winding the field magnet with wire and feeding it from an external source of supply which may be regulated by the introduction of resistance.

In the original German description of this interesting machine no data are given of its output or performance.

The New Jersey & Philadelphia Traction Company, formed to build an electric road from Morrisville, N. J., to Philadelphia, now under construction, has purchased the bridge across the Delaware at Trenton, at the foot of Calhoun street. The price paid was about $200,000. The bridge was owned by a syndicate composed of some of the heirs of the late Isaiah Williamson, among them being Henry W. Comfort, Crozier Reeves, Owen Moon, Jr., Wallace Buckman, F. S. Bronson, Harvey Ivins, Charles C. Case and Henry D. Parry. They paid $150,000 for the property, and so have cleared about $50,000. The bridge is intrinsically a paying concern from ordinary traffic, dividends being at the rate of four per cent on the $150,000. F. L. Shaw, William M. Butler, and N. Summer Merrick represented the traction company, the main interest in which is the house of James F. Shaw & Company, of Boston. The traction company controls, through both stocks and bonds, the trolley road now being constructed from Morrisville to Philadelphia, *via* Bristol, and the present acquisition supplies the most important factor in the project.

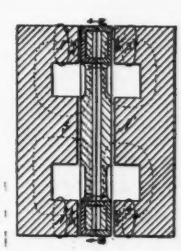


FIG. 7.—A THERMOELECTRIC MOTOR.

Auxiliary Power Recording and Indicating Electric Meters.

The illustrations shown herewith exhibit in detail the operation of a novel and highly ingenious type of electric meters, both indicating and recording, which has been brought out by the Whitney Electrical Instrument Company, through its general agents, Machado & Roller, New York.

Broadly, the principle on which the operation of these machines is based consists in causing the variations in the current to be measured to control the variation in pressure of a body of air in a closed vessel, this variation being in turn indicated by the rise and fall of a column of non-volatile liquid in a glass tube, back of which is secured the scale. The actual construction is as follows:

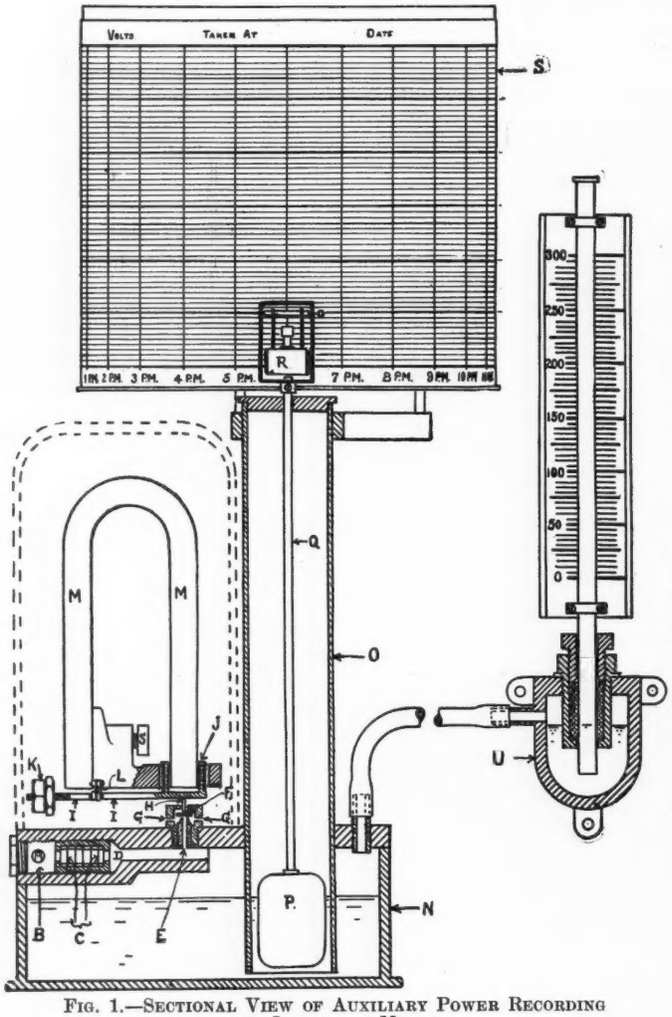


Fig. 1.—Sectional View of Auxiliary Power Recording and Indicating Meter.

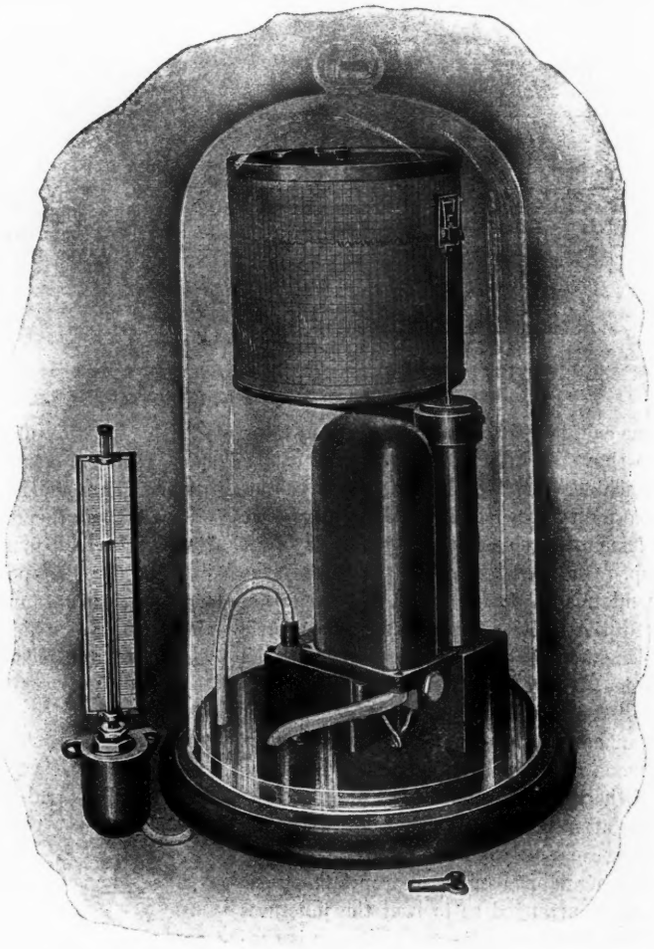


Fig. 2.—Auxiliary Power Recording Meter.

In Fig. 1 assume for the time being that some source, say a small pump, is delivering air at a fairly constant pressure of one and three-quarter pounds per square inch through the pipe A. This enters the chamber B and then flows through a series of porous diaphragms made of filter paper whose prime function is to serve as an air resistance and which incidently remove any dust particles. The air then enters the passage D, into which is drilled the opening E, which is capped by the valve F.

The valve itself consists simply of a small flat disk of non-oxidizable metal, F resting on a circular seat with escape ports G below it and a pin H resting on top. On the pin rests a spool J carried by one end of the lever I, on the other end of which is a counter-weight K, by means of which the effective weight on the pin H can be adjusted.

The spool is wound with wire through which the current to be measured is passed, this being done via the two short thin copper ligaments L which support and form the pivots about which the lever can oscillate.

A magnet M furnishes a field of force such that the reaction between it and the current forces the spool down with a force increasing as the current increases. The valve F is thus a variably loaded safety-valve whose blowing-off point is constantly and proportionately varied by the current variation. The counterweight K on the lever is so adjusted that when no current is passing through the spool the weight on the valve pin is such that the blowing-off pressure in D is one sufficient to force the liquid in the closed chamber N up through the glass tube O to a height R, which therefore is the zero of the scale. The pressure can not go above this when no current is on, as any tendency to increase simply results in lifting the valve slightly higher, whereupon more air escapes and the pressure falls back, nor can it go lower, as if there were this tendency the valve would partially close because of the spool weight and the less rapid escape of air through it would cause the pressure to build up again because of the constant flow of air from the high-pressure supply at A through the air resistance C.

Exactly the same thing holds good when the weight on the valve is that due to the non-counterbalanced portion of the spool weight plus the downward thrust caused by a given current through it. This gives what is practically a heavier loaded safety valve, so that the blowing-off pressure in N is higher, and this higher pressure of course forces the liquid up further in the glass tube, thus showing the presence of a current. The height to which the liquid rises is directly a measure of that current because the extra downward thrust on the spool is, from the magnetic field and spool design, proportionate to the current.

The air resistance C not only prevents the action from being so sudden that the indications are not dead beat, but in the

case of a decrease in current strength allows the air in the closed chamber N to flow back promptly and so register the decrease instead of having the greater part of the escaping air furnished from the higher pressure source A. The glass tube being but 24 inches long, the pressure at A (equivalent to about a 49-inch column of the liquid) is always sufficiently in excess of that in the passage D and the chamber N to cause the changes to be promptly registered.

From the foregoing it is seen that the zero adjustment is made by screwing in or out the counterweight K, thus shifting all scale values an equal distance up or down the tube. For actual calibration before shipment an iron screw S of heavy cross-section is provided, which on being brought closer to or further from the opposite leg of the magnet weakens or strengthens the field in which the active spool works by shunting a portion of the lines.

The total motion of the spool is exceedingly small—less than a hundredth of an inch in fact—and therefore there is not only no spring action of the suspending ligaments, the action in this particular being like that of the Kelvin balance, but as the spool acts always in the same field, the pressure it exerts on the valve and hence the air pressure in N and the resulting liquid column height are proportional to the current strength. In other words the scale divisions are evenly spaced.

It should also be noted that the only work that the varying current has to perform is to control the air pressure, the actual energy required to move the liquid and so show the variation being supplied by an independent source whose power is, comparatively speaking, unlimited.

The length of the instrument scale that has been adopted as standard is 18 inches from the 0 to the maximum reading, and this, combined with the conspicuous color of the liquid employed (a mineral oil that is colored a deep, clear red or a dark yellow, as may be desired), results in making the indications exceptionally legible.

Within extremely wide limits, variations in the pressure of the air supplied to the instrument through the pipe A have no influence whatsoever on the accuracy of the meter readings, this being because it is the weight on the safety valve and not the quantity of air flowing through the valve that determines the blowing-off pressure of the air in the passage D and the closed chamber N and therefore the height to which the liquid rises in the tube. As long as the supply pressure is sufficiently in excess of the blowing-off pressure in the closed chamber to cause a continuous flow of air to take place through the air resistance C, the meter will therefore indicate correctly, although the rate of speed of the column movement when the current strength measured changes will be slightly less or greater as the supply pressure is lowered or raised.

Experience has shown that dial illumination is entirely superfluous with this construction of instrument, as the liquid is

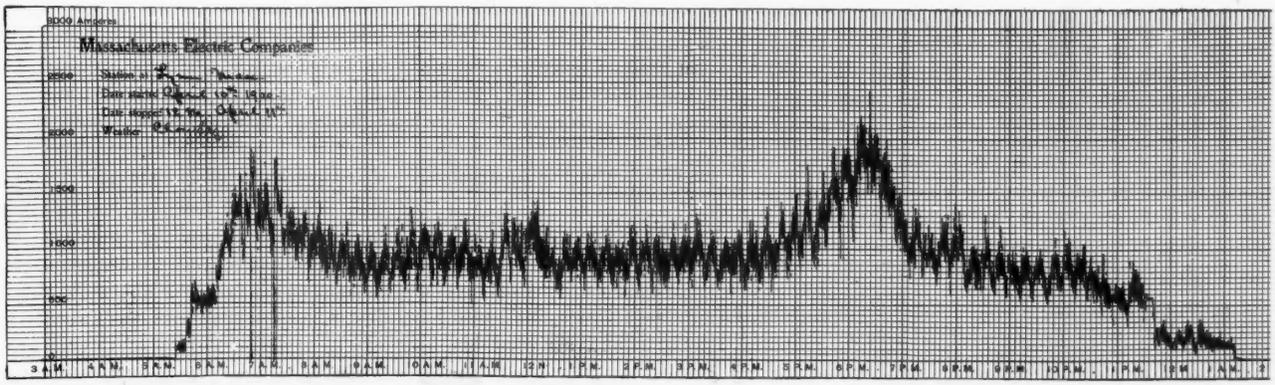


FIG. 3.—SPECIMEN RECORD OF AUXILIARY POWER RECORDING AMMETER.

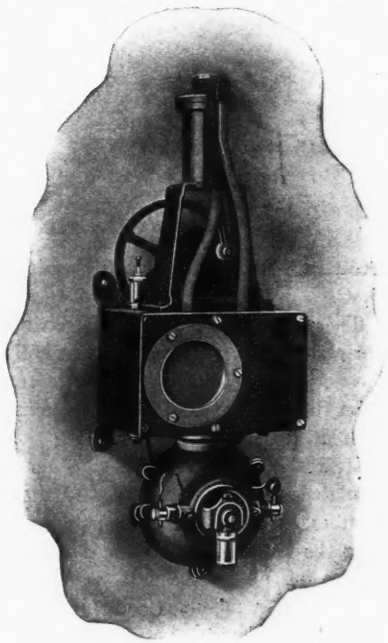


FIG. 4.—AIR COMPRESSOR FOR AUXILIARY POWER METERS.

an excellent reflector of itself, and the ordinary station illumination renders it visible at great distances.

The space occupied by the column-type meters is very small; the extreme overall width is two and three-quarter inches, and owing to the design of the magnet fields and the effective shielding of the protective caps over them, they can be mounted on centres but three inches apart without mutual interference. The space occupied behind the board (see Fig. 1) is but two and three-quarter inches broad by 10 and three-quarter inches high and on the face of the board two and three-quarter inches by 27 inches, and the drilling required for mounting is only three holes, three-sixteenth inch diameter to hold the mechanism in place, and one five-sixteenth inch diameter through which the passage connecting the chambers D and N, Fig. 1, goes.

Owing to the sensibility of the instruments, a 20 to 25 millivolt drop for full scale indication in an ammeter being perfectly feasible, there is ample margin for adjustment and all the instruments are standardized, so that the same drop is required for each, thus making all shunts interchangeable and all meters, whatever their range, intercomparable — points which are believed to be of great importance.

The recording auxiliary power meter works on the same principle. The column of liquid is made large enough to render the pen friction negligible. Fig. 3 shows a specimen record of one of these instruments. By connecting a second closed vessel with that employed in the indicating meter, a recording meter can be placed in the superintendent's office or elsewhere where it can not be tampered with.

To furnish the air required for the operation of these instruments, one of two separate types of devices are furnished.

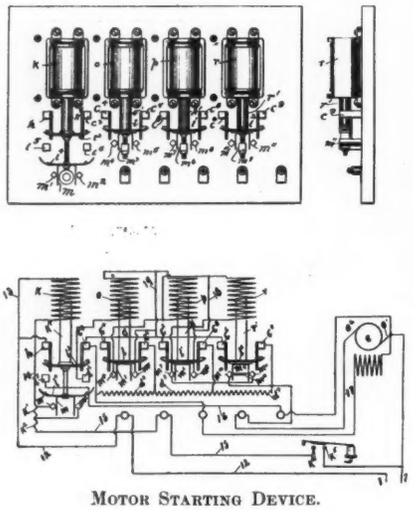
The first is a simple, single-cylinder, single-acting air pump mounted on a square iron box which serves as an air reservoir and driven by a one-twentieth horse-power motor suspended underneath and connected to the pump by a belt. This type is of sufficient capacity to run 50 indicators or 12 recorders, the construction of the latter being such that they require nearly four times as much air as the former. This device is shown in Fig. 4.

The motor can be furnished for either a 110 or a 220-volt circuit, and for either direct or alternating current, as may be desired.

The second type is a water-operated compressor which operates like an injector, the water carrying the air with it and compressing it to the desired point. These require about 10 gallons of water per hour per instrument with three-foot head, and are built in sizes to suit the particular installation. The instruments are built in sizes reading from 0 to 750 volts, and from 0 to 10,000 amperes, and in many sizes of less range.

Some Recent Electrical Patents.

A novel self-starter for electric motors has recently been patented by Henry H. Cutler, of Chicago, Ill., the object of the invention being to provide means whereby the armature resistance of the electric motor may be automatically removed from



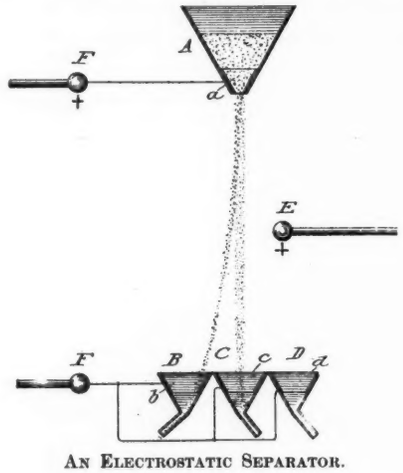
MOTOR STARTING DEVICE.

the circuit during the starting of the same.

In accordance with the invention, the usual starting resistance is provided in circuit with the armature of the motor, and a plurality of electromagnets are arranged to be successively operated to remove, in turn, portions of the starting resistance from the circuit, whereby the armature is permitted to start up gradually and build up in speed until normal operation results.

In practice, the armature resistance is divided into sections, and an electromagnet is provided for controlling each section, the first electromagnet being arranged to become energized when the counter electro-motive force of the armature has reached a certain value, thereby to cut out one of the sections of the resistance and lower the resistance to which the armature current is subjected, thus permitting the speed of the armature to increase. When the counter electromotive force of the armature has reached a second prearranged value, a second electromagnet is energized to remove another section of the resistance, and so on, the electromagnets being thus successively energized to remove successively the sections of the armature resistance from circuit until the desired speed has been obtained. The electromagnets are, in practice, connected in circuit, so that the first electromagnet, when energized, connects the succeeding electromagnet in circuit. There is preferably provided a short circuit about the electromagnet to remove the same normally from operative position, which short circuit, when open, includes the electromagnet operatively in circuit. The electromagnets are usually made alike and adjusted to become energized when traversed by a current of a definite value, and by arranging each electromagnet to connect the succeeding electromagnet in series with the same the resistance of the path is increased, thereby cutting down the current, and the succeeding electromagnet remains in circuit unenergized until the rise of voltage brings the current up to the prearranged value.

A new method of separating metallic particles from a mixture containing the same, has recently been invented by Elmer Gates, of Chevy Chase, Md., who has patented the same and assigned his interest to Theo. J. Mayer, of Washington, D. C.

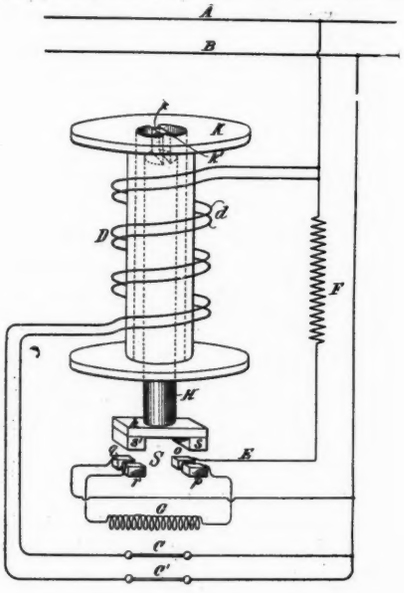


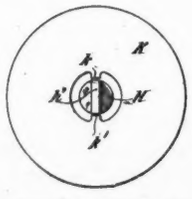
AN ELECTROSTATIC SEPARATOR.

The invention relates to electrostatic separation; *i. e.*, separation due wholly to the action of electrostatic charges made upon the moving particles of the mixture treated.

It is well known that all substances, if insulated, may be electrified and that insulators or non-conductors may, by rubbing, be caused to develop a noticeable charge of electricity. It is also well known that a metal, if uninsulated, does not hold its charge of electricity, it being rapidly conducted away. If, however, the metal be insulated, an electrostatic charge may be imparted to it and be retained thereby. It is upon this principle that the present invention is founded. The inventor discovered that when a falling stream of pulverized substance containing a mixture of conductors and non-conductors is subjected to an electrostatic charge, these substances become electrified to different degrees and are differently attracted or repelled by electrically charged poles, placed near the path of the falling stream. The inventor has put this discovery to use in the practical separation of such substances as, for instance, the separation of particles of gold from placer sand in which they are contained.

In carrying out the invention a supply hopper is provided with an exit aperture adapted to permit the stream of placer sand containing particles of gold to fall for a distance of 18 inches to receptacles arranged directly beneath the hopper. Both the hopper and receptacles are provided with metallic linings. A positive pole of a static machine is arranged in proximity to the falling stream of sand, and a pair of electrodes are arranged to supply an electrostatic charge to the falling stream throughout the intermediacy of the metallic linings of the upper and lower hoppers. Under these circumstances, by the employment of Leyden jars, in tension, in connection with an 18-inch, 10-plate static machine, so as to get the equivalent of a three-foot spark, the mixture will be repelled from the vertical path; but the particles of gold will be

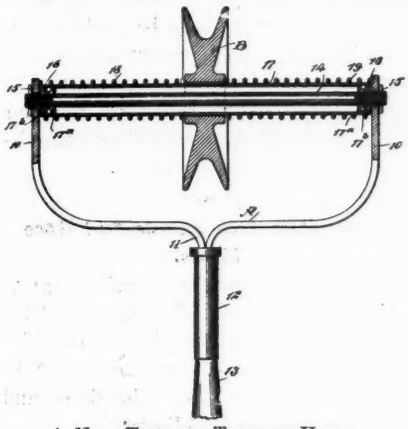




CONTROLLER FOR "GLOWER" LAMPS.

repelled much more powerfully than the particles of sand, which latter are, in reality, but slightly affected. The sand and metal particles falling from the upper hopper through the insulating medium of

the air retain the charge which they acquired in the upper hopper and are repelled by the pole or terminal, the repulsion of the metal particles being sufficient to divert from the main stream of flow and cause them to drop into one receptacle as heads, while the particles of sand drop into another receptacle as tailings,



A New Type of Trolley Harp.

the repulsion of the latter being practically negligible.

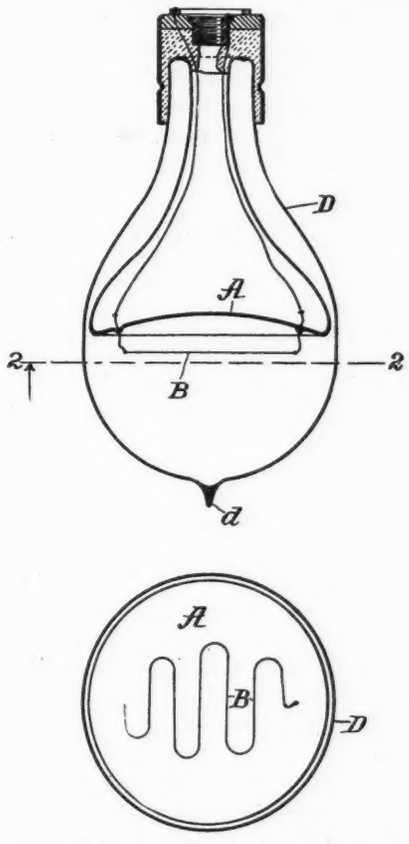
Marshall W. Hanks, of Pittsburgh, Pa., has been granted a patent on an improvement in "glower" lamps, and has made an assignment of the same to George Westinghouse.

The invention relates particularly to a circuit controller for the same. In these lamps the "glower" is made of rare earths required to be artificially heated until they reach a degree of conductivity which adapts them to serve as illuminants. Ordinarily it is the practice to include in the circuit with the "glower" a solenoid, and to arrange in proximity to the "glower" a heating device whose circuit is controlled by the solenoid. It is customary to attach the movable portion of such circuit controller to the core of such solenoid, whereby, on the operation of the latter, by means of a current sufficient to keep the "glowers" lighted, the core is drawn upward and the heating circuit thereby broken.

This invention provides a controlling device which is sensitive in operation and free from noise even when operated with alternating currents, and which interrupts the circuit of the heater on both sides, in order to prevent short circuiting, which sometimes takes place between the "glower" and the heater. Broadly, the invention consists in providing a double-pole switch operated by a solenoid and its core, and in guiding the core so that the contacts carried thereby shall be caused to maintain their proper relative position by means of a magnetic guide.

A new trolley head, or harp, has recently been invented and patented by Edward G. Johnson, of Brigantine, N. J., the purpose of the invention being to provide a trolley harp so made that the trolley wheel may freely move in the direction of either arm or member of the harp, and so to mount it that when it is relieved from side pressure at its periphery the wheel will automatically be returned to a central position between the members of the harp.

In carrying out the invention the harp is provided with the usual upright side members or supports and with a central

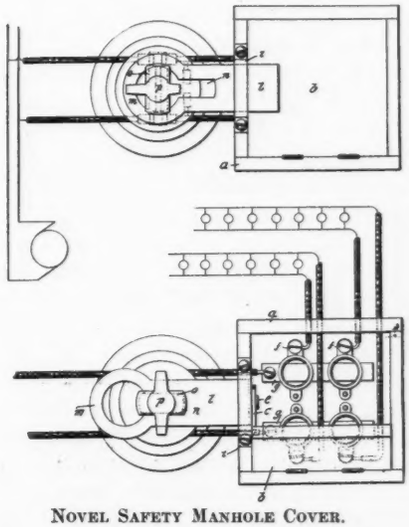


Enclosed Reflector Incandescent Lamp.

downwardly-extending socket adapted to receive the trolley pole. A shaft extends through the side members of the harp and is provided with ball races. A tubular shaft is mounted upon the peripheral portions of the ball races and extends from the inner face of one of the side members to the inner face of the other. Balls are arranged in the races between the two shafts. The trolley wheel is loosely mounted upon the outer or tubular shaft and is free to slide thereon. Springs are, however, coiled around the tubular shaft engaging with opposite sides of the hub portion of the trolley wheel and also against the inner faces of the side members. These springs have normally an even tension on the trolley wheel, holding it normally in a central position on the tubular shaft. If, however, it is necessary for the trolley wheel to move to the right or left when a car is turning a curve or is to pass an obstruction, the wheel is free to move in either direction to follow the trolley wire. When the wheel moves on the shaft it will compress one of the coiled springs and as soon as a straight line of track is reached the compressed spring will automatically return the trolley wheel to its normal position.

Samuel D. Washburn, of Boston, and Clarence H. Tinkham, of Cambridge, Mass., have been granted a patent on a novel incandescent lamp, which is provided with a mirror to reflect the rays of light outwardly.

In constructing the lamp, the mirror is arranged inside the bulb, and comprises a glass vessel, the base of which, when silvered, constitutes a concave mirror. In this vessel, the terminals of the filament are sealed, and the neck of the vessel is then united with the mouth of the bulb. In this way a bulb is obtained containing a sheet of glass across it, one surface of which is silvered by pouring in the proper solution through the neck of the vessel. The bulb is exhausted and sealed in the usual manner and is then, in all material respects, an ordinary incandescent lamp, except for the concave mirror across it, which reflects the rays of light and thereby greatly increases the brilliancy of the lamp.



Novel Safety Manhole Cover.

A new junction or connection box has recently been patented by Rudolf Hundhausen, of Wilmersdorf, Germany, who has assigned his interest therein to the Siemens & Halske Electric Company of America, of Chicago, Ill. The invention

aims to provide improved means whereby, when access is to be had to the terminals within the box, the connection of the mains with the terminals within the box has to be broken before access to the box can be had.

The invention may be broadly described as consisting of a junction or connection box containing the terminals of the supply circuits, a cover therefor, and a switch controlling the continuity of the mains, and cooperating with the cover in such a manner that before it can be removed or opened the switch will have to be operated to open the mains and before the switch can be operated to close the mains, the cover will have to be closed.

In accordance with the invention, a cover is provided which is mounted to swing upon hinges, a guard-plate movable with the cover for preventing the closing of the switch when the cover is opened, and a second guard-plate cooperating with the switch for preventing the cover being opened when the switch is closed. In order to open the cover, the guard-plate cooperating with the switch has to be shifted, the cover in being opened bringing the guard moving therewith into the path of the guard cooperating with the switch to prevent the switch being closed while the cover is opened. The guard cooperating with the switch also serves directly as a lock.

A Well-Built Trolley Road.

The Branford, Ct., Electric Railway Company has begun the operation of its line from East Haven to Short Beach and Branford. The line is said to be one of the most beautiful scenic routes in Connecticut, as it passes along the Sound where beautiful glimpses of the water may be had. The road is a remarkably fine piece of construction; the rails are all of 60-pound section, and especial attention was given to the selection of ties and poles; the roadbed itself is an extraordinary piece of work and in its construction several formidable engineering obstacles were successfully overcome. It is built for a long distance on a gravel filling over salt meadows such as are found along the seashore, and under which, when the top crust is broken, is anywhere up to 25 feet of soft mud before bottom is struck. Not daring to put the dirt on the mud itself, as it certainly would have gone through to the bottom, the New England Engineering Company, which built the road, first bought a large number of old railway ties and laid a floor of these on the mud, filling in the gravel over them. The result is a very firm and substantial roadbed, over which it is expected high speeds may be realized.

AUTOMOBILES

McJigger—Young Simpkins graduated from the Veterinary College last month and his father presented him with a case of instruments.

Thingumbob — Surgical instruments, eh?

McJigger—Oh, no. Machinists' tools for repairing automobiles.—*Philadelphia Press.*

What is the gender of an automobile? That is the question which has just been decided by the French Academy. The Immortals have come to the conclusion that she is he. This will be interesting to students of French grammar. The genders have bothered them a little already, and, like mosquitoes, they are likely to plague them for some time to come; but not one of them need ever in future trouble himself about the atrocious word, "automobile." In French it has five syllables, just one more than the language of Shakespeare allows to it; and the motocyclists cut three syllables from the new word and make it simply "auto," when they do not call it "teuf-teuf." However, the decision of the Academy has not given general satisfaction. Many French purists insist that if "locomobile" is feminine, "automobile" should be put upon the same roll of honor. The word being strictly an adjective, closely related to the widow, *"voiture,"* it should be feminine, according to the opposition. But, on the other hand, it seems very proper to make a rattling and rushing combination of oil, iron and fire take its place on hard masculine lines.—New York *Sun.*

Four electric automobile park carriages began regular trips August 4 through Central Park, New York city, from Seventy-second street and Fifth avenue to West Seventy-second street, to Riverside Drive, and up the drive to Claremont. Ten cents fare will be charged from Fifth avenue to the lower end of Riverside Drive. The round trip to Claremont and return will cost as now, 25 cents. The coaches are nearly identical in appearance with the present carriages. They will carry 12 passengers, and make the round trip in an hour. Upon the success of this new cross-town automobile service hinges the equipment of another route. The Central Park Carriage Service, which controls the Riverside Drive route, also has charge of a belt line entirely within the confines of Central Park, and four electric stages will be placed upon that route if the present service is successful. They will start from the Plaza at Fifth avenue and Fifty-ninth street and traverse the East Drive, passing the Casino, the Obelisk and the Art Museum. They will cross over from east to west at 106th street, and return by the West Drive to the Plaza. The round trip fare of 25 cents will be continued, and it is hoped that with the automobiles the journey may be made in less than an hour. The present stages were started a score of years ago. At that time the hackmen charged exorbitant rates for service in the Park and the Park Commissioners began to run the stages.

Automobile Exhibitions and Race Meets.

The next few months will witness great activity in the automobile industry. This is evidenced by the fact that four exhibitions and automobile race meets will be held before snow flies. The dates and places of these are as follows:

An International Automobile Exhibition and Race Meet will occur at the Washington Park Club Grounds, Chicago, from September 18 to 22, inclusive. This will be under the auspices of the Chicago *Inter-Ocean, and* $10,000 in cash prizes and trophies will be distributed. Over 75,000 square feet of exhibition space is available.

An Automobile Exposition and races will be held under the direction of Mr. E. E. Schwarzkopf, editor of the *Automobile Magazine,* at the Inter-State Fair, at Trenton, N. J., on September 24, 25, 26, 27 and 28. The exhibition space is free and numerous substantial cash prizes will be distributed.

The Automobile Club of America will hold an exhibition at Madison Square Garden, New York city, from November 3 to 10. The large amphitheatre will be used for speed and skill contests, and many foreign exhibitors are expected to participate.

An Automobile Show under the management of Mr. Marcus Nathan will be held at the Grand Central Palace, New York city, from November 14 to 24. Nearly half the available exhibition space has been engaged and the show promises to be a great success.

The Royal Electric Company, Montreal, P. Q., manufacturers of electrical machinery and supplies, light and power, have contracted with the Chambly Manufacturing Company for all the power produced by the latter during the next 50 years. In the year ending May 31 last the net profits of the Royal Electric Company amounted to $556,692 as against $267,684 for the previous year.

The New Alaskan Cable.

Mr. George F. Porter, manager for W. R. Brixey, of New York city, leaves on Saturday of this week, *via* the Canadian Pacific Railway, to accompany the expedition for laying the new cable to be put down between St. Michael and Unalaklik, and from St. Michael to Cape Nome, in Alaska.

The order for this cable was placed May 28, 1900, with the house of W. R. Brixey, manufacturer of kerite insulated wires and cables, for making, laying and equipping 187 miles of cable, divided into two sections; the Unalaklik section is 55 miles long, and the Cape Nome section is 132 miles long. The core of the cable is composed of seven No. 24 B. & S. gauge tinned copper wires, insulated with a covering of pure rubber one-sixty-fourth inch thick. Over this is laid kerite up to a diameter of three-thirty-seconds inch, and then a layer of tape; over this is built up a serving of three-ply tarred jute to an outside diameter sufficient to receive an armor of 16 No. 12 B. & S. galvanized steel wires. Over the armor is laid two reversed layers of three-ply tarred jute.

Before armoring, the core was subjected to a test under 5,000 volts alternating current, and showed, after immersion 24 hours in water, an insulation resistance of 800 megohms. After the completion and armoring of the cable it was placed on reels in lengths of 10 miles each, and, after immersion in the tank for a period of 24 hours, the specifications required it to withstand a pressure test of 1,000 volts and to show an insulation resistance of not less than 800 megohms. The cable was shipped from the factory at Seymour, Ct., by rail to San Francisco, where it will be loaded upon the Pacific Coast Steamship Company's steamship Orizaba. This vessel, which was chartered especially for the purposes of the expedition, is a steel ship of about 1,000 tons registry, and is well adapted for cable work. As loaded upon the cars at the factory the cable was coiled on reels each holding about 10 miles; these will be spliced into the proper lengths aboard the ship and coiled in the hold.

The contract calls for the making and laying of this cable as well as for its instrumental equipment and operation for a period of thirty days. This is said to be the first instance on record where a contract for cable even approaching this length has been awarded to an American manufacturer for making, laying and equipment. The instrumental equipment consists of three one-horse-power kerosene oil engines, which will be located at the three landings mentioned above and will drive the electrical generators that will furnish both direct and alternating current at various pressures up to 500 volts. There will be four sine-wave transmitters adapted to operate four Wheatstone automatic ink receivers. Aside from this automatic equipment the line will be fully equipped with Morse instruments for hand work; there will be supplied also 90 cells of Fuller battery and 24 gravity cells with extra supplies.

The Orizaba is expected to sail with the cable from San Francisco August 23, and will take along four electricians and 12 cable men. With good weather the vessel should reach St. Michael not later than September 3, and it is estimated that the two cables can be laid in three days. If this is the case the cables will be open for traffic September 6, or one day before the time specified in the contract.

Electrical Contractors Reorganize and Elect Officers.

The Association of Electrical Contractors of Pittsburgh and Western Pennsylvania, which organized in May, 1899, was granted a charter of incorporation from the courts of Allegheny County, July 21, 1900. It held its election of officers, for one year, at the new headquarters in the Lewis Building, Pittsburgh, Pa., on Friday, August 3, 1900, and the following officers were elected: President, George R. Mathieu; vice-president, James Brown; secretary, F. F. Howe; treasurer, I. Patterson. The following are the board of directors of the association: George R. Mathieu, F. F. Howe, I. Patterson, E. D. Smith, H. W. Clelland, R. A. M. Steel, J. M. G. Fullman, J. W. Hays and A. E. Eldridge. The objects of the association are for the encouragement and protection of trade and commerce by abating trade abuses, by exposing and preventing fraud in electrical work and material, and to establish and maintain a place of meeting for the purpose of improving and increasing the knowledge and skill of its members and the dissemination of useful information among its members.

The plant which the Neversink Light and Power Company proposes to erect near Cuddebackville, N. Y., will cost about $75,000 and will produce about 1,000 horse-power. The company hopes to have the plant in readiness for use by November 1 and expects to find a ready sale for its electricity in Middletown and Port Jervis. Dr. McBrair and other Middletowners are interested in the venture.

Metropolitan Street Railway Company Increases Its Capital.

The state board of railway commissioners has approved the application of the Metropolitan Street Railway Company, of New York city, for an increase in the amount of its capital stock from $45,000,000 to $52,000,000. The company will employ the proceeds of the sale of the new stock in changing its cable lines to the underground electric trolley on Columbus avenue, Broadway and Lexington avenue, and in changing from horse power on the Thirty-fourth street crosstown line to electric storage batteries. These expenditures for construction and equipment work will aggregate about $3,000,000, and the company proposes to utilize the remaining $4,000,000 for the payment of its floating debt contracted for the purchase of stocks in other street surface railroad corporations in New York city.

Storage Battery Patent Suits.

As mentioned in the ELECTRICAL REVIEW last week, the Electric Boat Company and the Electric Storage Battery Company have brought suits for alleged infringement of patent against the Gould Storage Battery Company, New York city, manufacturers of the Gould storage battery, and Sipe & Sigler, of Cleveland, Ohio, manufacturers of the Willard storage battery. Both suits are based on alleged infringement of patent No. 515,333, dated February 27, 1894, and issued to William W. Griscom. This patent covers a method of peroxidizing lead and is now the property of the Electric Boat Company. The Electric Storage Battery Company is a licensee to use the process and electrolyte claimed in the patent. The bills of complaint ask for accountings and writs of injunction.

The new electric automobile service through Seventy-second street from Fifth avenue, New York city—traversing the Park—to Riverside Drive and up the drive to Claremont was put in operation August 1. Three automobile coaches were used by the Central Park Carriage Service, which has charge of the new route, and they were found vastly inadequate to the traffic. A coach left Seventy-second street and Fifth avenue about once in 45 minutes and enough passengers were on hand each trip to fill vehicles three times as large. Three old-fashioned horse coaches had to be called down from the stables in West 150th street and sandwiched in between the automobiles.

ELECTRIC RAILWAYS

A project is on foot to connect with trolley the Schuylkill County, Pa., towns of Orwin, Reiner City, Donaldson, Tremont, Newtown, Swatara, Minersville and Tower City.

A Detroit, Mich., man has secured options through Flat Rock for the right-of-way for the new Toledo & Detroit electric road. The route will probably be along the old plank road.

The Baltimore & Ohio Railroad is planning an extensive experiment with traction electric motors between Grafton, W. Va., and Cumberland, Md., where the heavy grades will prove a crucial test.

By a vote of 53 to 8, the township of Geneva, Minn., has voted to issue $5,500 bonds to aid in building the electric line from Albert Lea to the village. The latter previously voted $2,500 bonds to aid this same enterprise.

An effort is being made to construct an electric railway from Alden, Iowa, to Britt, a distance of about 60 miles, in the near future. It is proposed to build a track of standard gauge, so that any cars can pass over it. The line, if built, will pass through Clarion.

The Trumbull County, Ohio, board of commissioners has granted the Youngstown & Sharon Electric Railway Company a 50-year franchise for a single line road, with necessary switches, in Hubbard township. The company retains the privilege of fixing the rate of fare between Youngstown and Sharon.

The Chattanooga, Tenn., Rapid Transit Company will at once rebuild the power plant which was destroyed by fire at Ridgedale, July 23. The president, S. W. Divine, expects to have his electric cars in operation within 60 days. The loss to the company will aggregate about $25,000.

The Philadelphia & Jersey City Trolley Road is now an assured fact. A right-of-way has been secured from Trenton to Eddington, and it is said that preparations are now on foot to absorb the line of Colonel Edward DeV. Morrell, between the Quaker City and Bristol, and a branch road will run from the latter city to Emily.

The capital stock of the Dayton, Ohio, & Germantown Traction Company has been increased to $450,000, and it is stated that work of an active character will be begun at once for the completion of the road from Germantown to Dayton. Citizens of Germantown and immediate territory eagerly await the completion of the road.

The Niagara Falls Street Railway Company has joined forces with the Gorge Road. The former company has just been granted a franchise, and it is expected to begin road building very soon. The officers of the first-named company are very similar to those of the Gorge Road, as follows: President, Francis V. Greene, New York; vice-president, H. P. Bissell, Buffalo; secretary-treasurer, Bert L. Jones, Buffalo; general manager, Godfrey Morgan.

The acquirement of the underground system of the Metropolitan District Railway, of London, is said to be contemplated by several prominent American capitalists. Mr. J. S. Forbes, president of the Metropolitan company, however, asserts that he knows nothing of the plans in the connection named, although a public announcement has been made that the road is about to be converted into an electric system. The line is 13 miles long. It taps London's most populous urban and suburban districts. The acquisition of a controlling interest would involve the investment of more than $25,000,000.

At the annual meeting of the Norwich Street Railway Company the following officers were elected: President, Billings P. Learned, of New London; treasurer, William A. Tucker, of Boston; secretary and superintendent, W. L. Adams. The old board of directors, with the exception of Mr. Perry, of Boston, was reelected, W. A. Briscoe, of Norwich, being substituted for Mr. Perry. The meeting voted to build the extension of the road from Taftville to Baltic, and the work will be begun at once, as all arrangements with the selectmen of the towns of Norwich and Sprague have been completed.

A new trolley line in Maine is in prospect and it is a long one. A petition has been filed which contemplates an electric road through Augusta, Manchester, Winthrop, Monmouth and Wales to a junction with the Lewiston, Brunswick & Bath Road at Sabatis Village, in the town of Wales. This road is to be known as the Lewiston, Winthrop & Augusta Street Railway. The petitioners are: Hon. Herbert M. Heath, of Augusta, president of the Lewiston, Brunswick & Bath Road; M. L. Masson, of Brunswick, general manager of the L. B. & B., and these directors of the same road: A. H. Shaw, of Bath; E. J. Lawrence and A. F. Gerald, of Fairfield; Theodore L. Peters and E. Burton Hale, Jr., of New York. The capital stock of the road is fixed at $160,000.

Officials of the Connecticut Lighting and Power Company are now taking preliminary steps toward building a trolley line from Waterbury, Ct., to Southington. It is stated that full right-of-way has been secured from the property holders on whose land the proposed line will run. The new line will take about 12 miles of track as planned and will give a through route on the Connecticut Lighting and Power Company from Naugatuck to Waterbury, to Plainville, touching Southington, to New Britain and Hartford. From Hartford, trolley may be taken up the Connecticut River a considerable distance. If the proposed line from Naugatuck to Ansonia is built, then Hartford will be connected by trolley with Bridgeport and it will be possible to travel from one side of the state to the other by electricity.

The stockholders of the Massachusetts Electric Companies met on July 30 to act on the proposition to increase the capital stock by 6,900 shares of preferred and 5,175 shares of common. This increase is for the purpose of securing control of the South Shore & Boston Street Railway. Another proposition was the purchase of the Lowell & Suburban Company, which was approved. When the Massachusetts Electric Companies was incorporated an unsuccessful attempt was made to purchase this property on a scale of $200 per share, but the shareholders opposed the scheme, and it was leased on an eight per cent basis. The majority of the then dissenting shareholders have now consented to sell their holdings on the basis of two shares of preferred and one and one-half shares of common of Massachusetts Electric for each share of Lowell & Suburban stock.

Announcement has been made of the sale of the Amsterdam Street Railroad to the Fonda, Johnstown & Gloversville Railroad Company. The price is said to be in the neighborhood of $175,000. It is expected that the line will in due time be extended across the country connecting with Johnstown and Gloversville. New directors were chosen for the Amsterdam road, consisting principally of New York lawyers. The Amsterdam road was established in 1873 by Amsterdam capitalists, but of late has been controlled by New York parties. In 1890 the road was equipped with electricity. John S. Wise, of New York, former Senator from Virginia, was president of the company. The purchase includes the Amsterdam company's lighting and power plant. The railroad will be equipped in first-class style, and will be extended to Rockton and Hagaman, a distance of four miles. In 1893, the line was extended to Akin.

Electric Heating by the Blower System.

This system consists, in brief, of small highly heated cylinders placed before a fan, in a case suitably shaped to give the best intake and outgo of air.

As shown in the accompanying illustration, the machine is of polished copper and brass. One of the first difficulties to be overcome in building such a heater is the objectionable hum of nearly all propeller fans. This was accomplished by making a centrifugal fan with curved disks connected by straight radial floats, the rear disk being the extreme diameter of the fan and having the centre cut away for air intake, the front disk being less curved and carrying the hub. This fan is a specialty belonging to the company manufacturing the heaters and is being adapted to desk and ceiling motors.

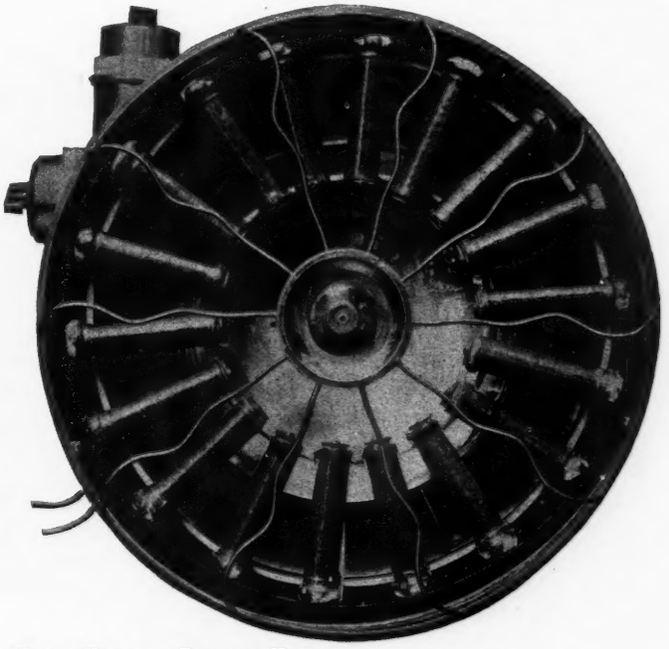
The motor is the standard type fan motor, adapted to simple and secure fastening in the case. It consumes one-half ampere, at 110 volts. The heating medium consists of clay tubes wound with fine German silver wire and covered with an insulating coat of enamel. This construction is claimed to eliminate two very serious defects present in most forms of heaters now in use; first deterioration of medium from oxidation of exposed wire, and, second, liability of short circuiting with attendant pyrotechnics.

Its advantages are the preliminary transfer of heat to the body of the tube, from the large surface of which the heat is wiped off into the room or car by the fan. The ability to heat a given volume of air is said, by actual tests, to be quadrupled by the use of the fan. The number and winding of the tubes can be adjusted for any degree of heat desired. A compact rheostat carrying two switches, one of which gives two speeds to the fan, while the other controls the heat, completes the machine.

This heater can be arranged to draw air from without the apartment or car, or in the coldest weather can operate on the air in which it is situated. In the electric heating of street cars a prime essential is the rapid conversion of the cold air entering by the doors when passengers are admitted and by the ventilators, to a temperature of suitable warmth for the comfort of the passengers. One of the great troubles with the present ventilating system is the fact that more cold air than is required is admitted to the car in such manner as to rob the car of the accumulated heat. By the use of this heater drawing an adequate, but not superabundant, supply of fresh air continuously into the car there is effected a very material saving in economy in the heating thereof. At the same time, the heater being placed either under the seat blowing longitudinally thereunder and admitting through registers to the lower portion of the car, or preferably placed over the doors in one or both ends of the car and connecting directly with the outer air, can quickly overcome this difficulty. Through its ability to heat air rapidly and its ability by means of the fan to circulate and thereby catch up and quickly warm the cold air admitted through the opening of the doors, it is claimed to overcome in an effective and economical manner all the principal difficulties experienced with present systems.

Two heaters, one in each end of a 40-foot car are said to be sufficient and to create two areas of circulation so gentle yet so positive as to give very perfect distribution of heat. This fact appeals at once to those companies having cross seats in their cars, where either the person is uncomfortably roasted or the whole car is too slow in heating. By the blower system, a 38-foot car, having 2,400 cubic feet of air space and having two heaters, was warmed an average of one degree a minute with an expenditure of a little less than 11 amperes and 550 volts. This is remarkably quick time, about one-third the time taken by the necessarily slow stationary heaters under the seats.

Other uses for this heater are for direct ventilation of buildings, a heater connecting each room of a school building, for example, directly with the outer air and only tempering the fresh air; in storage warehouses where a circulation of slightly warm air prevents mustiness; in the same line is the use on battleships, troop ships, and passenger steamers, especially when out of commission or laid up for Winter when a few heaters in ward rooms and passage ways keep the air moving and prevent stuffiness and moisture. Their especial advantage in case of ships out of commission is in the fact that the plant aboard need not be operated, but simply wires run aboard from a shore plant or from street mains, thus eliminating cost of coal and attention and avoiding danger of fire. Nearly all vessels being now equipped with electric plants, this economical form of heater will be of especial interest to marine builders and owners. The system is owned and controlled by the Boston Electric Heating and Power Company, of Boston, Mass.



FIGS. 1 AND 2.—SIDE AND FRONT VIEWS OF ELECTRIC HEATER.

The Electric Fan.

[*By "W. J. L." in the New York Sun.*]

Oh, yes,
I've got a cold,
A Summer cold,
The meanest of its race.
The black sheep
Of the flock of lesser ills.
How did I get it?
Please ask me something hard.
I got it
Sitting underneath a fan.
Not fan of palm,
Or feathered finery,
Or handiwork of Jap,
Swayed lazily
By some fair lady's hand.
But fan of brass
Sent whirlingly through space
At lightning speed
By lightning spark.
The popular electric fan,
The tempter of an overheated man,
The terror
Of the Summer time.
Unto its cool caresses I
Unthinking, gave myself,
And sinking at its base
Into an easy chair,
I let the music
Of its soothing whirr
Lull me to sleep.
Methought I floated on the wings
Of angels fresh from Shadyland
That fanned me as they flew
And turned the perspiration
On my burning brow
To pearls of pleasantness.
I dreamed of babbling brooks
That told of Spring;
Of purling rills
That sang of shade;
Of sweet, sequestered woods,
Unscorched by sun;
Of fair, green fields,
Dew-kissed from morn to night;
Of rose-bloom
And of rhapsodies—
And then the vision changed
And I beheld
A hideous horror,
Brazen winged,
That flew forever,
Whirling round,
And round and round,
Unceasingly around,
And beat upon its cage of wire,
The meanwhile
Whirring wickedly
And blowing out its icy breath
Upon my neck
And down my back
Into the very marrow of my soul.
Chilled through
And stiffened to the bone,
My clothes, as cold and clammy
As the hand of death,
Stuck to my shivering skin.
I, with a sneeze
And wheeze and snort,
Awoke.
Oh, yes,
I god a code,
A dab bad code
Ad I know how I god id.

Who cares?
Avaunt, cold poet!
Aye, "to the woods"
Betake thyself!
Let the murmuring
Of the pines,
The sobbing of
The surf,
The sounds of Nature
In any form
Swallow up
Thy catarrhal protest!
Where wouldst thou be
In thy trade of poet
Without the
Electric fan?
Many a time and oft,
Dear Lampton,
Hath its breezes
Made dollars out of space
Or earned a salary check for thee.
It ill becomes one of thy craft
To use deflected wind
From such a source
For poetry—and on
The Great Page
Of *The Sun*, to boot!
Hot Air may be decried as slang,
But Cold Air,
From a poet's wheezy brain
Should not be used
As Poetry.
Stand aside, prithee!
Or watch thy toes,
Else the Car of Progress,
Elektron's Electromobile,
Will hurt thee good
And another will take thy space—
One who knows
A good, cool
Thing,
When he feels it!

VOLTABOUT.

Electricity Supply in British Cities.

United States Consul Marshal Halstead, of Birmingham, England, writes as follows:

A few of the main thoroughfares of London will soon be electrically lighted, some poles having recently been put into position. Piccadilly had a few as long ago as the Fall of 1896, and no doubt the success of that experiment is regarded as warranting extension on careful lines. Birmingham is still a gas-lighted city, and there seems to be no street electric-lighting movement, though on January 1 last the corporation took under its municipal wing the small electric lighting company. New mains are now being put in, and the question of electric street lighting must come up within a year or two, as must also the question of cost to consumers. Cork is one of the smallest towns with electric service and gets its electricity as cheaply as any city. The charge in Cork is 4½d. (9 cents) per unit for the electricity used in the first two hours every day and 1d. (2 cents) during the succeeding hours. For motor purposes, the charge is 4d. (8 cents) the first two hours, and 1d. (2 cents) thereafter. In Birmingham, there is a uniform rate of 7d. (14 cents) per unit to the general run of consumers—that is, to the great number using 100 units or less per month. For any quantity in excess of 100 units, 4½d. (9 cents) is the charge. There is also a special provision of 4d. (8 cents) per unit up to 100 units per month for electrical energy used for motors or all-day loads, and any quantity in excess of 100 units is 2d. (4 cents). A unit means here the burning of 17 ordinary incandescent lights one hour.

Wall Street and the Electrical Stock Market.

The current week in the stock market has been especially dull and uneventful. The dominant factors are those growing out of the European money markets and the troubles in China. These, however, had little effect during the current week. The market closed the week in a sort of holiday style, many brokers and traders being out of town.

On the New York Stock Exchange, General Electric closed the week at 130 bid and 131 asked, a gain of 1⅞ points for the week. Metropolitan Street Railway, of New York, closed at 156 bid and 156¼ asked, a loss of 1 point for the week. Third Avenue Railroad closed at 109 bid and 111 asked, a loss of 1 point for the week. Brooklyn Rapid Transit closed at 57⅜ bid and 57⅝ asked, a loss of ¼ point for the week. Manhattan Railway, of New York, closed at 91 bid and 91¼ asked, a gain of ¼ point for the week.

On the Boston exchange, American Telephone closed at 144 bid and 144¾ asked, a loss of ¼ point for the week. Erie Telephone closed at 96 bid and 97 asked, indicating no change for the week. New England Telephone closed at 123 bid and 124 asked, a loss of 2 points in the bid price for the week.

On the Philadelphia exchange, Electric Storage Battery closed at 72 bid and no asked price, showing no change for the week. Union Traction closed at 37 bid and 37½ asked, a gain of ¼ point for the week. Electric Company of America closed at 8⅞ bid and 9 asked, a loss of ⅛ point for the week.

On the curb, or outside market, in New York, Electric Vehicle closed at 19 bid and 22 asked, a loss of 1 point for the week. Electric Boat closed at 16 bid and 18 asked, indicating no change for the week.

Wall street, August 4.

Electric Church Bells.

In the parish of Runwell, Essex, England, says a British contemporary, an apparatus has been lately erected by the rector for ringing the church bells by electricity. The origin of the invention is rather curious. The rector, finding a difficulty in obtaining bell ringers, rung the bells for three months himself. In order to save the labor involved in performing this task, he invented the "automatic ringer," and erected the apparatus in the church tower. By connecting the machine with the electric current already in use for lighting the church and rectory, he succeeded in ringing the bells with perfect order and precision. The invention is in all respects an absolute success.

Gas Engine Igniting Apparatus.

It is a curious fact that one of the most difficult of the minor applications of electricity is to the ignition of the explosive charge in gas engines. The apparatus here described and illustrated is intended to obviate most of the difficulties that have attended this variety of work and to insure, by the formation of a large and powerful spark, the proper ignition of the charge.

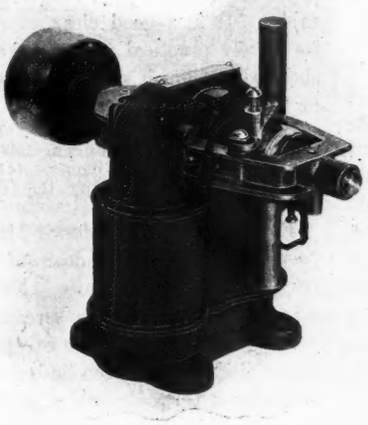


FIG. 1. GAS ENGINE IGNITING DYNAMO.

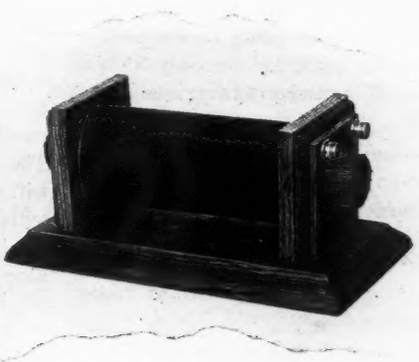


FIG. 3.—SPARK COIL FOR GAS ENGINE IGNITION.

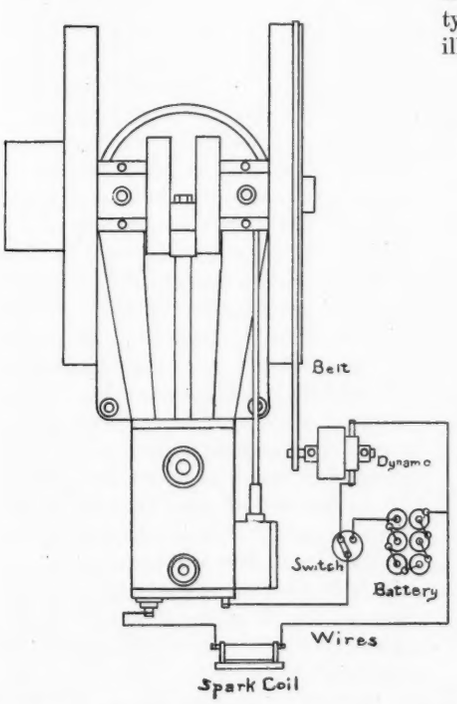


FIG. 2.—DIAGRAM OF GAS ENGINE IGNITER CONNECTIONS.

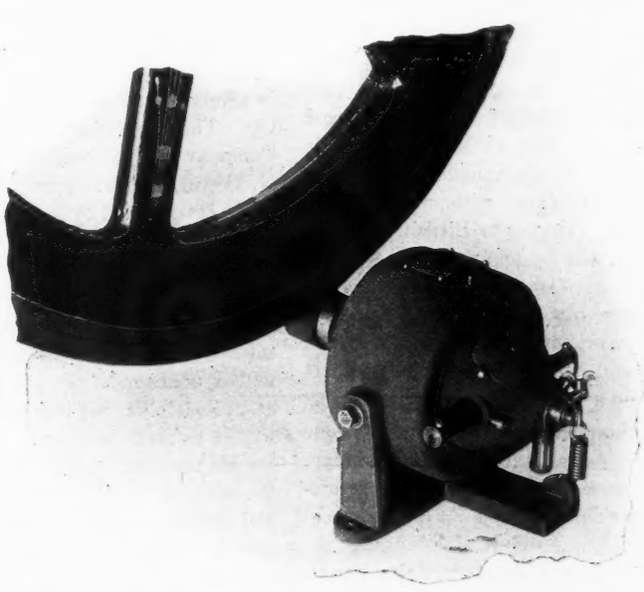


FIG. 4.—METHOD OF DRIVING IGNITER DYNAMO.

Fig. 1 shows a small dynamo intended to be driven by a belt from the fly-wheel on the gas engine for this purpose, and Fig. 2 shows in diagram how the dynamo is connected through a switch and a spark coil to the spark points in the cylinder of the engine. The battery shown in the illustration is intended to start the engine igniting the initial charge while the engine is standing still, as of course the dynamo must be driven up to speed before it begins to generate. When the engine is moving at full speed the switch is placed so as to connect the dynamo with the coil and cylinder and disconnect the battery.

Fig. 3 shows a spark coil which is used with this outfit and is built of generous dimensions in order to accomplish successfully the purpose for which it is designed.

Fig. 4 shows an interesting departure from the belt-driven dynamo mentioned above and at the same time a different type of dynamo and its carriage. The illustration is almost self-explanatory. The dynamo is hung on trunnions in a carriage below the fly-wheel. It is provided with a friction pulley and a spring which presses this against the fly-wheel, so that when the engine is running the dynamo is driven. Merely turning over the engine by hand in starting drives the dynamo fast enough to generate current for the initial spark, and when the engine is going at full speed the current is automatically regulated to the proper amount by the slight slipping of the friction pulley. All of this apparatus is manufactured by the Remy Electric Company, of Anderson, Ind., which also constructs a variety of other electrical apparatus, including X-ray and construction supplies.

The Hot Springs, Ark., Street Railway Company has made the preliminary arrangements to establish another important enterprise in that city. Everything is now in readiness to commence at an early date the construction of an electric power and light plant which, in addition to furnishing light and power necessary to operate the street cars, will supply both light and power for commercial purposes. Plans for the plant have been prepared by an electrical engineer in Pittsburgh, Pa., and it is expected that the first work on the building will be begun in a very short time.

TELEPHONE AND TELEGRAPH

The Pacific States Telephone Company made a net gain of 812 subscribers in July. The total number connected is 77,302, which includes 19,332 in San Francisco.

The Michigan Telephone Company has begun the construction of its long-distance lines between Saginaw and Ludington, following the Pere Marquette right of way.

The Erie Telephone system made a net gain of 2,121 subscribers in July. The total number connected on July 31 was 128,576. The number waiting connection is 4,405.

The ownership and control by boards of trade of an elaborate system of telegraph wires connecting all the leading commercial exchanges of the country, to be established at a cost of $5,000,000, is being promoted by the Chicago Board of Trade.

The instrument statement of the American Telephone Company for the month ended June 20 shows:

	1900	1899	1898
Gross output	65,463	48,878	21 551
Returned	30,093	18,028	10,011
Net output	35,370	30,845	11,540
Since Dec. 20:			
Gross output	411,609	389,899	187,884
Returned	162,753	109,765	83,306
Net output	248,856	280,134	104,578
Total outstanding	1 829,361	1,405,384	1,(23,699

Charles McCaul is working on plans for the new and finely finished telephone substation to be erected for the Bell Telephone Company, at Fifty-seventh street and Woodland avenue, Philadelphia, of face brick, stone and iron. It is to cost about $15,000, being two stories high, with usual appointments, etc.

A project of enterprise is being agitated at Joanna, Pa., and at Morgantown. It is the erection of a telephone line, starting at the latter place, with a station at Joanna, and running to Birdsboro, where connection will be made with the Pennsylvania Long-Distance Telephone. The officers of the line have been conferred with and their proposition presented for the erection and maintenance of the line. It is based on a three-years' guarantee.

The Susquehanna Valley Telephone Company was organized in Binghamton, N. Y., recently, with the following officers: President, Joseph F. Lannon; secretary and treasurer, R. J. Manning; directors: Joseph F. Lannon, John Ferguson, Frank Zeller, H. S. Williams, M. J. Lannon, C. E. Titsworth. The company will at once apply for a charter of incorporation, and the lines will connect with neighboring towns. One hundred and fifty shares are already subscribed for, which guarantees the same number of phones, or half the number in business places.

A scheme for the complete reorganization of the Mutual Telephone Company, of Des Moines, Iowa, was presented at a recent meeting of the board of directors. Amendments to the articles of incorporation of the company have been prepared by James C. Hume, the attorney for the company, whereby it is hoped to cut down the indebtedness and enable the directory to make much needed improvements in the service. The amendments provide for the same capital stock, $90,000, but $45,000 of it is to be preferred stock, bearing interest, while the remainder will be common stock, and all the stock now outstanding will be declared common stock. The sale of the preferred stock, it is hoped will be sufficient to bring the indebtedness within the legal limit, make contemplated improvements, and put the finances of the corporation in good condition. The corporate debt is now nearly $37,000, which is in excess of the legal limit. The imperative need of this change has been felt for some time. Another important change in the articles proposes to increase the telephone rates to holders of common stock.

The Michigan Traction Company, operating the Kalamazoo City electric lines, the Battle Creek lines and the Kalamazoo-Battle Creek interurban, has sold out its entire interests to the Railway Companies General, of Philadelphia, Pa. The purchase price is not given out for publication. Under this change the lines become of the above concern, which controls lines in several of the large cities of the country. The name of the Michigan Traction Company will be retained, but Major L. N. Downs, who was president of the company, is succeeded by Evan Dicks, of Philadelphia. Taylor Faunce will succeed Dee Allen as secretary and will also conduct the treasurership. Fred Griswold, of Battle Creek, will be retained as superintendent of the entire system. The lines will be managed from the general offices at Philadelphia, but it is stated that there will be no material change in the policy of the management except toward improving the systems in both cities in a very material degree. There is great opportunity for the new management in this direction, as the equipment in Kalamazoo, especially, is greatly in need of being replaced, being antiquated and very much out of repair. Anything in this line would be greatly appreciated by the citizens of Kalamazoo, and would insure much better patronage for the lines. The new company will also rush the work of finishing the interurban line.

BOOK REVIEWS

A Hand-Book of the Electro-Magnetic Telegraph. By A. E. Loring, New York, 1900. D. Van Nostrand Company. Boards. Four by six inches. 116 pages, 24 illustrations. Supplied by the ELECTRICAL REVIEW at 50 cents.

This little book was written to present the principles of the telegraph in a brief and concise manner for the benefit of practical operators and students of telegraphy. It is a good clear, simple treatise purely practical in its make up, and should be of much value to those studying or interested in telegraphy.

Traité de Magnétisme Terrestre. By E. Mascart. Paris. Gauthier-Villars, 1900. Paper. Six and one-half by ten inches. 441 pages, 94 illustrations. Supplied by the ELECTRICAL REVIEW at $4.00.

For a long time Professor Mascart has been regarded as the dean of the electrical profession in France. No more admirable works than the several volumes bearing his name and the excellent treatise on electricity written by him in collaboration with Professor Joubert have appeared in the last quarter-century. The present work is one that sustains the high character of its predecessors. The subject is one which has received too little attention from the bulk of physicists and its literature is generally inaccessible and very highly technical. It was the object of the author, in writing this work, to give observers in the work of terrestrial magnetism a general view of the subject and to instruct them in the knowledge necessary for the understanding of the observed phenomena and the use of the necessary instruments. It treats first of the theory and the principal theorems necessary for the understanding of the subject, and describes with great particularity the various instruments used, their mode of installation and their method of use. Without attempting to extract the scattered but enormous literature of the subject, M. Mascart has digested the essential ideas and the most important results contained in it, and has brought together in this volume a large quantity of matter both of great importance and deep interest. A final chapter on the magnetism of ships will be found of considerable practical interest. It is not going too far to predict that this important and excellent work will soon find an English translation.

Where Electricity Will Shine.

[Pan-American Magazine, Buffalo, N. Y.]

Electricity will be the most prominent and certainly the most interesting feature of the Pan-American Exposition, both in a popular and scientific sense.

Telephone Communication With a Beleaguered Force.

A newspaper dispatch states that two Chicago inventors have devised a scheme for communicating with beseiged towns during war times by means of telephones carried by box kites. An experiment in telephoning to inaccessible spots by dropping a telephone from a box kite was conducted in Cicero last week and proved successful. The kites used by the experimenters are box kites of the Eddy pattern, 18 feet long, 2 feet wide and 1 foot high. Two kites fastened together are used, and, when the distance which they are to travel is great, three or more sets of tandem kites are employed.

Attached to the kite line, about 100 feet below, is a pulley through which runs a light weight, double-conductor, flexible wire of aluminum. Attached to the end of this wire, swinging free from the pulley, is a telephone, and another telephone is ready for operation where the kite flyers have their position. The kite is sent up until directly over the place with which communication is desired. Then the telephone, swinging below the kite, is lowered by paying out the circuit wire and letting it slip through the pulley, drawn by the weight of the instrument, until the people beneath secure possession of it and are put in communication with the kite flyers.

The kite flyers are enabled to tell when their telephone is directly over a given point by means of a stadimeter. The inventors say that by means of the box kites they can effect communication with a place 10 miles away, when the wind is right, although the ground between may be held by a hostile force.

NEW YORK CITY—The New York & Queens Electric Light and Power Company has filed a certificate with the Secretary of State setting forth that it has merged the Electric Illuminating and Power Company, of Long Island City, the Jamaica Electric Light Company and the New York & Queens Gas and Electric Company.

Oil Transformers.

With the introduction of higher and higher alternating-current potentials, the manufacture of transformers has necessarily become a field for improvements of many kinds, especially as regards their insulation. The method of insulation consisting of immersing the core and coils of the transformer in oil has met with a great degree of success in practice, and a long series of experiments, embracing several years of actual use of such instruments, has convinced the General Electric Company, that for most purposes these transformers possess advantages of a high order. That company has therefore produced the type of oil-insulated transformer illustrated in the accompanying engravings for which it claims a number of important features of superiority.

The core is built up of simple rectangular punchings, with interlocked joints. Each sheet of the iron entering into the construction of the core is thoroughly insulated from its neighbors, and the core is locked together without the use of bolts. The joints are so interlocked as to reduce the necessary magnetizing current to a minimum and to prevent the disagreeable humming due to vibration and always a sign of wasted energy. On the straight parts of the core the secondary coils are wound directly and over them the primary coils are wound. This construction, it is claimed, gives the most compact possible form of winding for the space occupied and greatly assists in the prevention of vibration which might have a bad effect on the insulation. Since the bounding surfaces between the primary and secondary coils are simple cylinders in outline, it is possible to provide a highly effective form of insulating shield between the high and low-potential coils. Perhaps one of the most unique advantages of this method of transformer building, however, is that the coils, not being ironclad, are on the exterior of the core, where they present large radiating surfaces and are more easily cooled by contact with the oil. This largely prevents increase of temperature and corresponding increase of resistance in the coils, and adds considerably to the efficiency of the transformer.

Another considerable departure from familiar types is in the shape of the case and the method of holding the active elements of the transformer in it. Projecting pockets are provided at the top of the case containing porcelain bushings, through which the primary and secondary leads are brought out. This construction permits the bushings to be located in a vertical position and safely protects them from mechanical injury in transportation. The details of construction of the transformer are so well shown in the illustrations that further description is unnecessary.

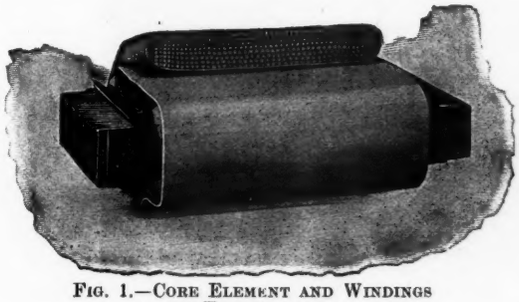


FIG. 1.—CORE ELEMENT AND WINDINGS OF TRANSFORMER.

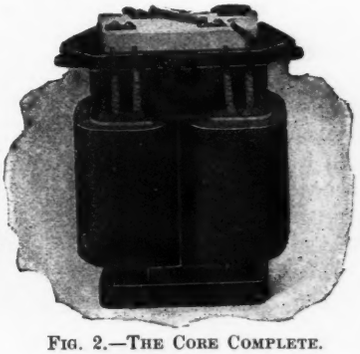


FIG. 2.—THE CORE COMPLETE.

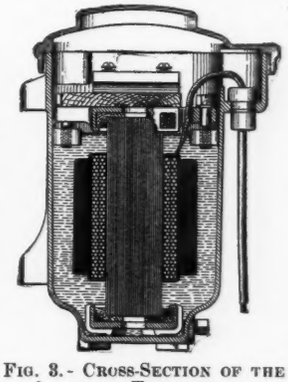


FIG. 3.—CROSS-SECTION OF THE COMPLETE TRANSFORMER.

An American Electrical Engineering Company in England.

J. G. White & Company, Incorporated, 29 Broadway, New York city, the well-known electrical engineering company, has established the firm of J. G. White & Company, Limited, of London, which will handle all the company's business outside of North America. The capital of the new corporation is $500,000, which is composed of 5,000 shares of six per cent cumulative preferred stock, and 50,000 shares of common stock. The directors of the company are: J. G. White, chairman; O. H. Baldwin, managing director; A. N. Connett, chief engineer; W. C. Burton, electrical engineer, and E. B. Wyman. A. H. Beatty is secretary of the company, and the mechanical engineer is Mr. E. P. Jones. The record of J. G. White & Company in the United States is well known and no name stands higher than theirs in engineering circles. The company is to be congratulated on its growing business and upon the strong organization which it has effected for handling its foreign contracts.

Incandescent Lighting as an Architectural Decoration.

While the incandescent lamp possesses features of merit which make it nearer the ideal light than any other that has yet been invented, it possesses also another feature which is of extreme importance, architecturally speaking—the fact that it permits of the use of light as an accessory of decoration. In recent years some of the best artists and sculptors of the country have combined to produce methods for the utilization of incandescent lamps in this manner, and some of the results achieved have been of surpassing beauty. The illustrations shown herewith well exhibit some of the achievements in this line recently made, and are here presented by the courtesy of the General Electric Company.

Fig. 1 shows the electric light fixture on the newel post of one of the great staircases in the new Library of Congress at Washington. The bronze figure was sculptured by M. Philip Martigny and is only one of the many elaborate and magnificent decorations using the electric light in the library. Fig. 2 represents the ball-room of the Waldorf-Astoria Hotel, in New York city, where electric lights have been used with a lavish hand for the decoration of this highly elaborate apartment. In smaller fixtures great advance in taste has been shown as may well be seen from Fig. 3 representing a chandelier in the Hotel Savoy, in New York city, and Fig. 4 showing lights grouped around a column in the Hotel Netherland. Fig. 5 shows a light fixture in the Waldorf-Astoria, while Fig. 6 shows a design for an exterior fixture of peculiarly graceful and beautiful style. Fig. 7 illustrates how well the incandescent lamp lends itself to the decoration of panel ceilings, the view being taken in the dining-room of the Hotel Marlborough, in New York city. Another ceiling fixture of neat and decorative design is shown in Fig. 8, this being one installed in the dining-room of the Hotel Savoy, in New York city. The illustrations tell their own story in this matter and it is unnecessary to dilate upon the opportunity offered by the incandescent light to decorators and architects for the beautification both of interiors and exteriors.

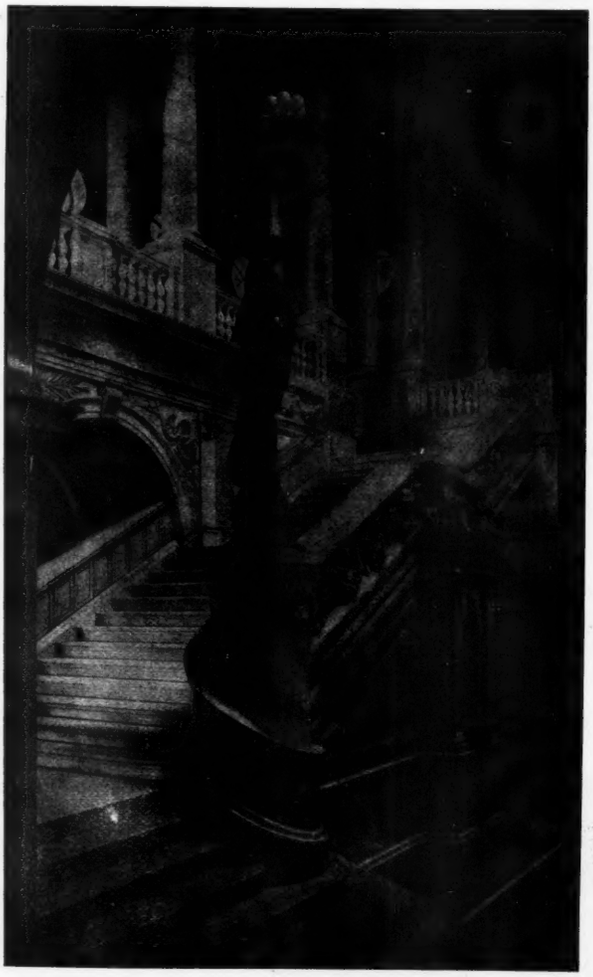


FIG. 1.—ELECTRIC LIGHT FIXTURE ON STAIRCASE IN LIBRARY OF CONGRESS, WASHINGTON, D. C.

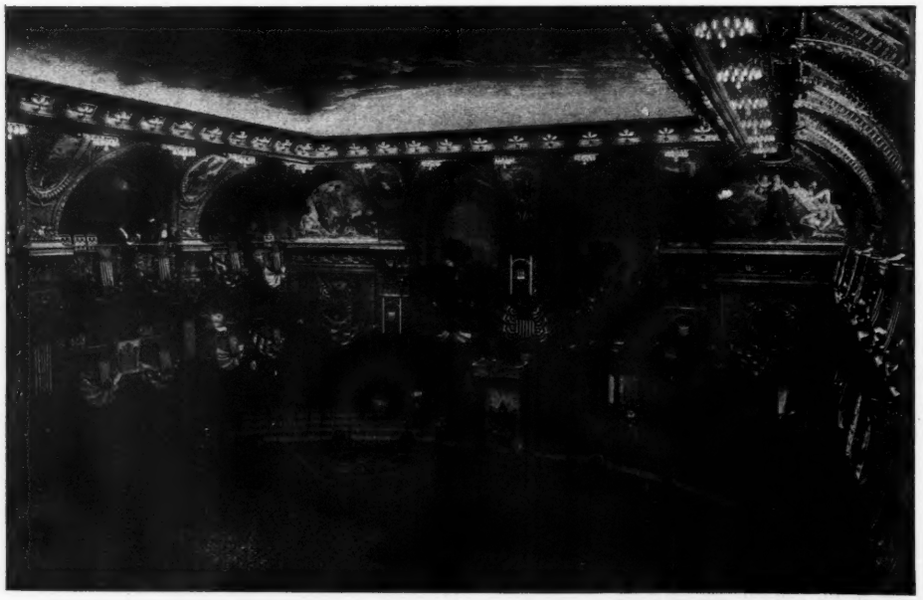


FIG. 2.—BALL-ROOM OF WALDORF-ASTORIA HOTEL, NEW YORK, SHOWING ELECTRIC LIGHT DECORATIONS.

Mr. Marconi Writes a Letter to "The Thunderer."

[*From the New York Times.*]

Decidedly bitter resentment is expressed in a long letter written to the London *Times* by the managing director of the Marconi Wireless Telegraph Company, his grievance being the manner in which certain government and other officials have announced the discontinuance of the wireless telegraph service established a year ago between the South Foreland and the Goodwin lightship. The apparent purpose of these announcements

was to give the impression that the system had failed to demonstrate either its efficiency or its value or both. The writer of the letter declares that his instruments have not only worked perfectly ever since they were put up, but that they have proved their commercial practicability and their utility as a means of communication, especially in cases of danger to life and property. In reality, he more than hints, the service was stopped because of opposition in official quarters, and this opposition was the result of fear lest there might be interference with the National telegraph monopoly. "The attitude of our government," he says, "toward this latest application of science to industry and commerce has been much the same as they have exhibited toward every branch of electrical enterprise." For over a year the Marconi company has been trying to get a general license to transmit intelligence between ships and the British coast, but, although the license was not refused, it has not yet been granted, and promising negotiations with one steamship line for the adoption of the new system mysteriously came to nothing. The company, though troubled, is not discouraged. Its representative writes: "I believe that in a few years sea telegraphy, or telegraphing from steamers to the shore, from passengers as well as from the captain, will be at least as common as land telegraphing from a corresponding number of people. If some departments of state are apathetic and others are hostile, I am glad to say that the admiralty is fully alive to the value of the system and its application to ships of war, and has arranged with this company to install Marconi's wireless telegraphy on board more than 30 ships and torpedo stations." Is our own "admiralty" equally alert?

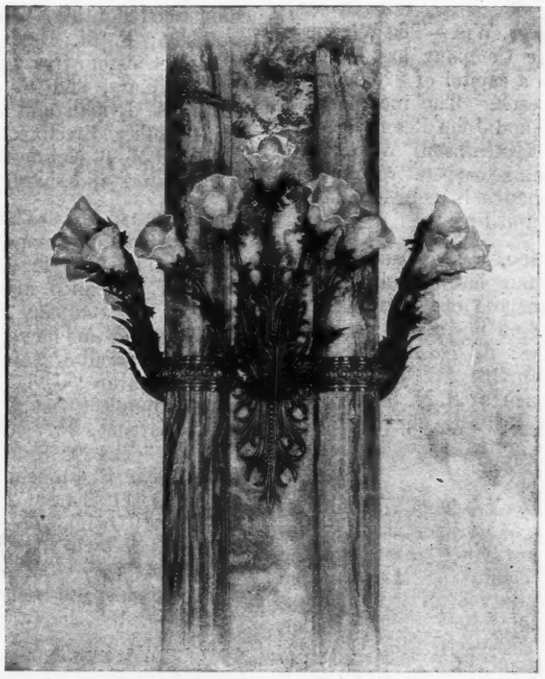


FIG. 4.—COLUMN FIXTURE IN HOTEL NETHERLAND, NEW YORK.

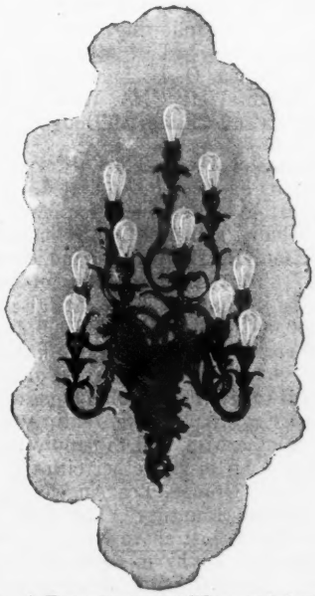


FIG. 5.—A FIXTURE IN THE WALDORF-ASTORIA.

FIG. 6.—AN EXTERIOR FIXTURE.

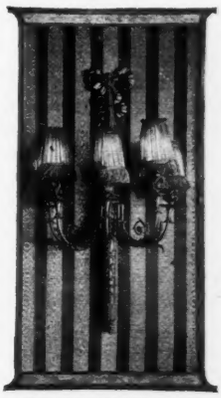


FIG. 3.—AN ELECTRIC LIGHT FIXTURE IN THE HOTEL SAVOY, NEW YORK.

FIG. 8.—CEILING FIXTURE IN THE HOTEL SAVOY DINING ROOM.

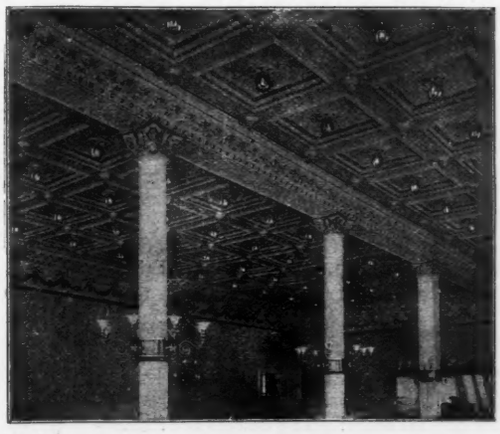


FIG. 7.—INCANDESCENT LAMPS IN CEILING, HOTEL MARLBOROUGH, NEW YORK.

CORPORATION NEWS

SYRACUSE, N. Y.—The Crouse-Hinds Electric Company has been incorporated with a capital of $10,000. The directors are: H. B. Crouse, J. L. Hinds and J. A. Hopper, of Syracuse.

STURGEON, MO.—The New Century Telephone Company has been incorporated to operate a telephone line. Capital, $10,000; incorporators: O. D. Gray, W. Seymour, both of Sturgeon; T. R. Morris, S. P. Hulin, T. D. Sayle, all of Clark.

NEW ALBION, N. Y.—The Cattaraugus Electric Light and Power Company, of New Albion, Cattaraugus County, has been chartered. Capital, $12,000; directors: A. J. Setter, Collins Centre, and Frank Crawford and H. P. Bishop, Cattaraugus.

OTISCO, N. Y.—The Otisco & Cedarville Telephone Company, of Otisco, has been incorporated to operate a telephone line from Otisco to Syracuse. Capital, $1,500; directors: H. D. Pomeroy and I. W. Bardwell, Otisco; Lee Cummings, Navarina.

NEW AUGUSTA, IND.—The New Augusta Telephone Company, of New Augusta, Marion County, has been incorporated. Capital stock, $10,000; directors: M. J. Wagle, Walter Johnson, W. B. McDonald, John Harcourt, S. I. Rodibaugh and George T. Avery.

ROCHESTER, N. Y.—The Genesee Electric Company, of Rochester, has been chartered to supply electricity for light, heat and power in Rochester. Capital, $50,000; directors: P. H. Flynn, Fred C. Cochon, of Brooklyn, and William A. Boland, of New York city.

RED BLUFF, CAL.—The Red Bluff Electric Light and Power Company has filed articles of incorporation. The directors are: Henry A. Gesford, R. S. Masson, H. C. Donnels, P. S. Coke, W. I. Priest, W. F. Wallace and A. R. Kanaga. The capital stock is $125,000, of which $700 has been subscribed.

SAN FRANCISCO, CAL.—The Fort Miller Power Company has been in corporated to generate and transmit electric power. Principal place of business, San Francisco. Directors: W. Saunders, A. J. Morganstein, T. O. Carter, K. D. McCann, San Francisco, and F. G. Berry, Fresno. Capital stock, $1,000,000, all subscribed.

SACO, ME.—The Reuterdahl Electric Company has been organized at Saco for the purpose of manufacturing, leasing and selling electrical goods, with $100,000 capital stock. The officers are: President, Arvid Reuterdahl, of Providence, R. I.; treasurer, George F. Western, of Providence, R. I. Certificate approved July 23, 1900.

NEW HAVEN, CT. — The Franklin Electric Manufacturing Company has filed in the state secretary's office a certificate of organization. The capital is $10,000, all paid in. The subscribers are the following: Jonathan Camp, Hartford, 34 shares; John Waring, this city, 33 shares, and Charles I. Hills, of Elizabeth, N. J., 33 shares.

STEVEN'S POINT, WIS.—The Wisconsin River Telephone Company has been incorporated with a capital of $25,000, 500 shares at $50 each. The incorporators are: F. L. Dille and John Reton, Steven's Point; A. L. Hutchinson, Weyauwega. The company will be cooperative and operate a local exchange in connection with the Wolf River toll line.

SAN FRANCISCO, CAL.—The Mt. Lassen Power Company has been chartered to generate and dispose of electricity, etc. Principal place of business, San Francisco. Directors: A. Hochheimer, Willows; C. L. Morrill, F. Smith, A. F. Johns, San Francisco; R. M. Saeltzer and H. L. Shannon, Redding, and Park Henshaw, Chico. Capital stock, $1,000,000; subscribed, $70.

LOCKPORT, N. Y.—The Home Telephone Company, of Lockport, has been incorporated to construct and operate a telephone line connecting the principal points in the county of Niagara. Capital, $125,000; directors: M. B. Butler, Niagara Falls; George H. Frost, Buffalo; A. E. Lord, S. R. Rawson, I. H. Griswold, James A. Drake, F. H. Sudro and F. W. Martin, Elyria, Ohio.

CHESTER, PA.—William Bartram, of Lansdowne; Charles Ballinger, of New Jersey; Jno. M. Deal, of Fernwood, and W. Cloud Alexander, Esq., of Media, have secured a charter under the laws of New Jersey for a company to be known as the American Universal Underground Electric Railway System. The principal office of the company will be at Camden, N. J. The capital stock is made up of 4,000 shares of the par value of $50 each.

MACON, ILL.—The Secretary of State has issued license for the incorporation of the Hervy City & Southern Electric Railroad Company. The company plans the construction of an electric road from Hervy City to Shelbyville. The capital stock of the association is to be $150,000. The principal office of the road is to be located at Macon. The incorporators and members of the first board of directors are: J. Smith Butram, Decatur; Robert B. Hennigh, Prairie Home; Robert H. Woodward, Harold Woodcock and John M. Turner, of Macon.

TOLEDO, OHIO—Articles of incorporation have been filed at Lansing for the Michigan & Ohio Electric Railway, with a capital stock of $200,000, the incorporators being: Washington I. Robinson, W. W. Johnston, J. W. Donovan and Milton Carmichael. This company proposes to build an electric line north from Toledo through Temperance, Ida, and other villages of Monroe County, reaching Dundee, Scofield and Maybee and giving a large territory direct connection with Toledo that now can not reach that market without much difficulty.

TOOELE CITY, UTAH—The Electrical Power Company, organized with a capital of $50,000 in $1 shares, has been incorporated. The purpose of the company is to generate electricity for power and commercial lighting. Joseph C. Orme is president; F. M. Davis, vice-president; A. J. McCuiston, treasurer; Phares Dunyon, secretary, and F. M. Lyman, Jr., George A. Lyman and Charles McBride are the other directors. James M. Gollahar and M. B. Nelson are the remaining incorporators and shareholders.

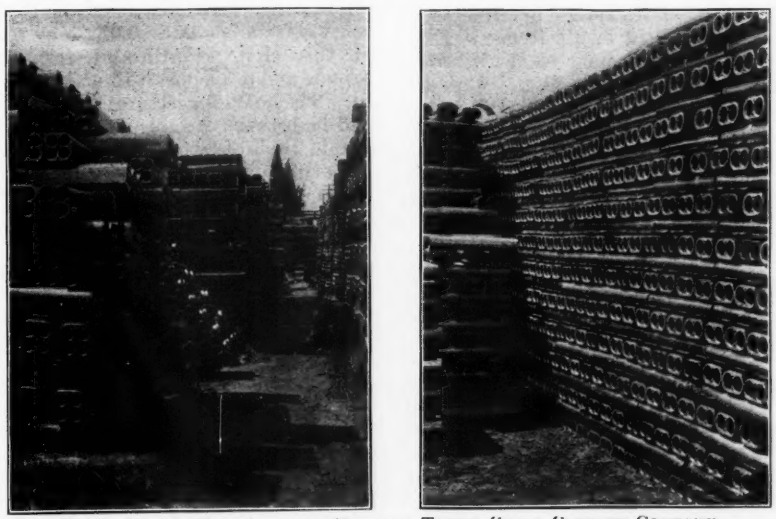
ST. LOUIS, MO.—The Elevated Railway Construction Company, an outgrowth of the old Unicycle Elevated Railway Company, has filed articles of incorporation. The company is capitalized at $100,000, and this amount is divided into 10,000 shares, all of which are paid. The stockholders are: J. L. La Prelle, 3,010 shares; Hamilton Daughaday, 454 shares; C. W. Sargent, 227 shares; J. W. Williams, 574 shares; James F. Coyle, 454 shares; John H. French, 244 shares; L. A. Brown, 3,311 shares; Harmon J. Bliss, 227 shares; Dwight Tredway, 818 shares; B. S. Adams, 20 shares; B. F. Nelson, 264 shares; John J. Worsham, 34 shares; C. E. Chapman, 227 shares, and William P. Nelson, 136 shares.

FORT WAYNE, IND.—At a meeting of the stockholders of the Belden-Larwill Electric and Manufacturing Company, the company was reorganized and the capital stock was increased. Articles of incorporation have been prepared and will be filed soon. By the terms of the new company, the capital stock has been increased to $100,000, divided into 1,000 shares of $100 each. The company will prepare to do business on a larger scale. Mr. O. N. Heaton was appointed attorney and the following gentlemen were elected as a board of directors: Messrs. E. H. Belden, O. H. Larwill, S. M. Foster, Abram Weil, C. A. Wilding, George P. Evans and Charles McDougal.

REDLANDS, CAL.—The California Power Company has been incorporated. The incorporators and directors for the first year are: Henry Fisher, B. O. Johnson, F. P. Morrison, H. H. Sinclair and George B. Ellis. The principal place of business will be Redlands. The capital stock is $2,500,000, divided into 25,000 shares at $100 each, of which $601,000 has already been subscribed. The purpose of the company is to acquire electricity, gas and electric energy by purchase, renting, generating or otherwise, and to supply the same to Los Angeles and other cities in Kern, Riverside, Orange, Los Angeles and San Bernardino counties. The flow of the Kern River, just above Kernville, was recently filed on by members of the company. At that point there is a fall of about 800 feet to the mile, which, it is estimated, will generate 20,000 horsepower. F. C. Finkle, with a gang of engineers, is already running the lines for the conduit. The company expects to have the preliminary work done inside of nine months, when work upon the conduit and power house will be begun.

Vitrified Terra-Cotta Conduits.

The constantly increasing mileage of underground wire in cities of the United States has made a great and enlarging demand for conduit material. Of all the various kinds that have been tested, none has proven in the end more satisfactory than vitrified clay, and enormous quantities of this type of conduit are being laid down every day. The illustrations show two views of multiple-duct conduits in the yards of the Potomac Terra-Cotta Company, of Washington, D. C., which manufactures, under the Mason patents, a type of salt-glazed, vitrified conduit that has met with very considerable success in use, both for electric light and power wires, and telephone cables. It is claimed by the makers that this type of conduit is to all intents and purposes, indestructible by the elements when properly laid. Vitrified terra cotta or clay has lasted through a period longer than that covered by history; even to-day cylinders and bricks of this material are found in the Babylonian ruins, practically intact. On this account, and because of the glaze which is applied to the conduit sections, inside and out, thus greatly facilitating the drawing in of wires and cables, the conduit has been highly indorsed by many users. The sections are made in lengths of 30 inches and are connected with dowel pins so that an unskilled class of labor suffices in laying them.



VIEWS IN THE YARDS OF THE POTOMAC TERRA COTTA CONDUIT COMPANY.

TROY, N. Y.—The Troy Mantel and Grate Company has been incorporated to manufacture mantels, grates, tile, gas and electric fixtures. Capital, $30,000; directors: George S. Emerson and Harriet A. Emerson, Lansingburg; Charles D. McCarthy, Troy.

ELECTRIC LIGHTING

Philadelphia Electric Company directors have made two calls on the stock of $1.25 each, one payable November 21, and the other payable January 21.

The Boston, Mass., Electric Light Company has issued its annual report, and it is the best in its history. The gross income was $990,797, against $910,892, and the net for stock $367,511, against $252,397 in 1899. The increased net was brought about largely through a reduced operating cost, due to the centralization of the company's plant. The company during the year increased its dividends from six per cent to eight per cent, while the report shows 12¼ per cent earned on its $3,000,000 capital. The company is stated to be the cheapest producer of electric power in the world. The directors and officers are the largest owners of these securities.

The annual meeting of the Beverley, Mass., Gas and Electric Company was held recently, and Article 1 of the by-laws was amended by inserting after the word Salem in the fourth line the following: "Or by a written notice signed by the Clerk and mailed to each stockholder at their last known post office address." The old board of officers were reelected as follows: President, Sidney W. Winslow; clerk and treasurer, Andrew W. Rogers; directors: Sidney W. Winslow, Herbert F. Winslow, Andrew W. Rogers and Charles F. Pritchard.

Extensive improvements at Tumwater Falls, one of the greatest resources of the city of Olympia, Wash., have been begun by the Light and Power Company, and when completed power to an almost unlimited extent will be at the service of manufacturers. A force of men under the supervision of A. J. Gillis has begun the construction of the damming of the upper falls and the fluming of the water to the power plant 700 feet below. The power at present is derived from the middle falls, and aggregates about 400 horse. Under the new arrangement there will be serviceable at least 1,000 horse-power, sufficient to run many more wheels, and give employment to hundreds of more hands. The most improved dam will be built at the upper falls, and a huge flume will be constructed. The flume will be 10 feet square in the clear, which really means a wooden pipe 10 feet in size. A flume this size will carry three tons of water to the foot, so the magnitude of the affair may at once be seen. The flume will start from the east side of the dam and run down to a point just above the power house, from which it will be carried across the river on a bridge.

The California Power Company, of Redlands, Cal., has been incorporated. The object of the new company, as stated in the incorporation papers, is to acquire by purchase, renting, generating or otherwise, electricity, gas and electric energy, and supply therefrom the city of Los Angeles and other cities in Los Angeles, San Bernardino, Riverside, Orange and Kern counties, as far as the supply will permit. The principal place of business will be in this city, the incorporators and directors for the first year being Henry Fisher, H. H. Sinclair, George B. Ellis, F. P. Morrison and B. O. Johnson, all of this city. The corporation is capitalized at $2,500,000, consisting of $25,000 shares of $100 each. Of this stock there is actually subscribed $601,000. The company proposes erecting a power plant on the Kern River, a short distance above Kernville, where the flow of the river, varying from 20,000 to 40,000 or more inches, was recently filed on for power purposes by members of the company. The company already has Engineer F. C. Finkle in the field, with a gang of engineers running the lines for the conduit. There is, at the point proposed for the power house, an effective fall of 800 feet, which it is expected will be able to generate for the company 20,000 horse-power. This power is to be transmitted a distance of 125 miles to Los Angeles, where it is expected to be delivered, with a loss of about 25 per cent. The location of the plant is some distance above the intake of the Kern River Power Company, which has been doing a little work there for two or three years, but has not completed a plant for operation. It is expected that from six to nine months will be consumed in running the lines and making the preliminary work, after which the work upon the conduit and power house will be begun as soon as practicable, and a year or two will be consumed in completing the work for operation.

INDUSTRIAL NOTES

John T. McRoy, of New York and Chicago, is sending forth his August calendar blotter, containing information appropriate to the troubles in China.

The Western Electric Company, Chicago, is sending out illustrated bulletins describing its series enclosed alternating arc lighting system, and arc lamps and accessories.

The C. W. Hunt Company, 45 Broadway, New York city, is sending out a neat booklet printed in colors, showing its general line of machinery for the rapid handling of industrial products. The pamphlet may be had free on request.

New York & Ohio Company, Warren, Ohio, manufacturer of the Packard incandescent lamps and transformers, is sending to its friends a handsome miniature wall calendar for August. The calendar is pretty to look at, and may be obtained free on request.

The United States Telephone Company, St. Louis, Mo., is about completing the installation of the telephone exchange at Sedalia, Mo., for Churchill & Chaddock. This exchange will have an ultimate capacity of 1,000 numbers, and 600 will, at the completion of the board, be in operation.

The Fort Wayne Electric Works, Fort Wayne, Ind., has issued bulletin No. 1011, describing the Wood automatic double release, motor-starting rheostat circuit breaker and switch combined. The illustrations in the bulletin are descriptive and a diagram of connections is shown. The bulletin may be obtained free on request.

The Incandescent Electric Light Manipulator Company, 116 Bedford street, Boston, Mass., is sending out a circular describing its bulb cleaner for incandescent lamps, the White lamp cord adjuster, and several styles of bulb renewers and cleaners. The circular may be obtained from the above address on request.

McClure's Magazine for August is a midsummer fiction number and contains numerous short stories of merit, including a special one by Josiah Flynt, called "A Bill from Tiffany's," in which the life of the metropolitan policeman and of professional thieves is carefully reported. It is an excellent number of an excellent magazine.

"Why, yes. Everybody knows the 'Allen' goods are standard," is what one electrician was heard saying to another lately. And that combination linked together, "Allen" and "standard," the one synonymous of the other, accounts for the constant, steady growth in public favor of the Allen soldering compounds—stick, paste, salts.

The Joseph Dixon Crucible Company, Jersey City, has issued a leaflet describing its graphite products for automobile use. This company makes a specialty of graphite lubricants for the gears of electric, steam and gasoline motors. Any one interested in the subject of graphite lubrication is invited to correspond with the Joseph Dixon Crucible Company, which is recognized as an authority on the subject of graphite.

"The Electric Lighting of Passenger Cars," is the subject of a booklet published by the Consolidated Railway Electric Lighting and Equipment Company, 100 Broadway, New York, and sent out with the compliments of Mr. John N. Abbott, vice-president and general manager. The subject is thoroughly gone into and is developed in a manner calculated to interest and impress the layman as well as the experienced railroad man. The booklet is designed for free distribution.

Lightning Arresters is the title of a booklet just issued by the General Electric Company from its press, at Schenectady, N. Y., the beauty of the work being, as usual with this company's publications, of a high order. Lightning arresters of all the various types made by the company, for both alternating and direct-current circuits, and for both high and low voltages, are illustrated and described, and much interesting information is contained in the booklet, which may be had upon application to any of the company's offices.

The Farr Telephone and Construction Supply Company, of Chicago, reports a lively trade, much better than anticipated in mid-Summer. This company has now in the printers' hands a new catalogue and "Hand-Book of Information," size six and one-half by ten inches, 50 pages. It will contain as fine photograph pictures of the company's telephones, transmitters, magneto bells, receivers, switchboard drops, jacks and plugs as can be made; and also illustrates all electrical supply material used in the telephone business. This book will be sent to any address free upon request.

The Western Telephone Construction Company, Chicago, has just closed a contract for the equipment of the city of Williamsport, Pa., with a multiple telephone switchboard having a capacity of 1,800 drops, 1,000 of which will be put in immediate operation on the installation of the board. One thousand central energy telephones for the system have also been ordered from this company. This company has also received for Pottsville, Pa., an order for a switchboard of 800 capacity, of the multiple type, central energy system, and 500 central energy telephones. It has also received an order to increase the equipment of the exchange at Wilmington, Del., from 1,200 to 1,500 instruments.

The Cooper Union Free Day School for instruction in technical science will be opened in New York city October 1. The course of instruction is designed especially to supplement the complete scientific course of the high schools of this city, thus offering to the graduates of these schools who intend to engage in engineering work of any kind, facilities for studying practically the line of work adopted. Laboratories are already equipped. Instruction will be given by lectures, recitations and practical work at the laboratory tables. The various branches of engineering work for which provision is here made, are mechanical engineering, electrical engineering and civil engineering. The complete course will require three years of study. For the first year the work of all students will be substantially the same, but will at the beginning of the second year be designed especially to meet the requirements of the three several kinds of engineering work. No examination for admission to either course will be required of applicants who bring certificates showing that they have completed the required course of mathematics of the high schools of this city. Certificates from other schools and academies will also be accepted. The hours for lectures and recitations will be between 9 A. M. and 3 P. M. For certain kinds of laboratory work or outdoor surveying, the above period will be extended. The hours of the lectures, as well as the time of recitations and laboratory work, will be definitely stated in a programme yet to be published. It is assumed that each student taking the regular course will be engaged in some class exercise from two to three hours a day. The school year begins October 1 and ends about May 15. The trustees have also made provision for certain special students who, being engaged in some technical work, desire aid and instruction in their own specialties exclusively. It is probable that the chemical and electrical laboratories will most frequently afford the desired facilities. There are no fees for tuition in any department. The student is required to buy the text books necessary for class instruction, and to pay for chemicals used by him in the laboratory. Application blanks may be obtained by personal application at the office of the Cooper Union, or by letter addressed to the assistant secretary. A programme of exercises will be published in September.

Messrs. Haynes & Clausson, of Chicago, have filed their acceptance of the street railway ordinance, recently passed, granting them the right to build and operate a street railway in Kenosha. The company, which is being backed by B. J. Arnold, of Chicago, also filed two bonds, one for $10,000 and one for $50,000, to insure its carrying out the terms of its contract with the city. The bonds were personal and are secured by a signature of Z. G. Simmons, president of the First National Bank, of Kenosha. Mr. Arnold, in speaking of the road, stated that the line was not in any way connected with the M., R. & K. line or the Chicago & Milwaukee line, and that the road would be operated by a wholly independent company.